FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE

TRANSACTIONS

OF THE

SEVENTH CONGRESS.

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TRANSACTIONS

OF THE

SEVENTH CONGRESS

HELD IN

BRITISH INDIA

DECEMBER, 1927

EDITED BY

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Kasauli British India

General Organizing Secretary for the Seventh Congress

VOLUME I.



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FOREWORD

I HAVE been asked to write a Foreword to the publication of the Transactions of the Seventh Congress of the Far Eastern Association of Tropical Medicine which was held in Calcutta in the year 1927 When I say that it has been found necessary to publish these Transactions in three volumes, it will be self evident that—

(i) the Congress was a great success, and

(ii) that a very large amount of work was transacted during the meeting

The Transactions of the Congress held in Hongkong in 1912 were published in a single volume of 399 pages Since then the Transactions of succeeding Congresses have, when printed, gradually increased in size, until, at the Sixth Congress held in 1925 in Japan, it was found necessary to publish them in two volumes and the number of pages was 2313

The Scientific Proceedings of the present Congress have been arranged in three volumes, each of approximately 1000 pages as follows —

Volume I —Contains Sections I and II —Medicine and Dermatology, Pathology Surgery, Ophthalmology, Gynæcology and Diseases of Pregnancy Mental Hygiene and Psychiatry, Radiology, Dentistry, State Medicine General and Special Hygiene, Maternity and Child Welfare

Volume II —Contains Section III and Part of Section IV —Plague, Cholera, Dysentery, Sprue and Intestinal Infections, Bacteriophage, Leprosy, Tuberculosis, Bacteriology, Typhus-like Diseases, Leptospiræ, etc, Protozoology, Malaria (control), Malaria (general), and Malaria (treatment)

Volume III —Contains the remaining part of Section IV and Sections V and VI —Kala azar, Medical Entomology,

Helminthology; Diseases of Nutrition; Deficiency Diseases; Immunology and Chemotherapy; Rabies and Anti-rabic Treatment; Pharmacology; Veterinary Science; an account of the Scientific and Commercial Exhibitions.

A full account of the Business Proceedings is being published separately in report form which can be considered as an official supplement to the present volumes.

In arranging the material for publication every attempt has been made to reproduce, as nearly as possible, the proceedings as they actually took place in the individual sections. It was found necessary, in order to transact work during the Congress, to arrange for six sections to run concurrently both morning and afternoon throughout the week. Even by this arrangement many papers had to be read by title only for want of time. It can be easily understood that the discussions which arose were in many cases extempore and consequently the Editor has had to edit the remarks made by the speakers, in some cases, possibly, making alterations in the wording of the observations made. The Editor, however, has in every case endeavoured to retain the essential part of the remarks made by the speakers and he hopes that no misrepresentation has been made by him unwittingly.

I would like to add a word as to the work done by the Rapporteurs. There is no doubt that the success of the Congress depended, in no small measure, on the way in which these officers carried out their duties. In many cases the chairmen of the various sections were foreigners and consequently, possibly, their knowledge of English was limited. It fell upon the Rapporteurs, therefore, to see that reports made were in correct order, that the daily programme was carried out as intended by the Organizing Secretary, and also it fell upon them to write a short summary of the proceedings of each session for the General Organizing Secretary and for the Press.

The Editor wishes to acknowledge his indebtedness to Madame Asheshov and Major R. H. Malone, I.M.S., for undertaking the correction of the MSS. and proofs of the papers written in French, and to Lieut.-Col. R. B. Seymour Sewell, I.M.S., Director of the Zoological Survey of India, Major R. B. Lloyd, I.M.S., Imperial Serologist, and Major E. F. W. Grellier, R.A.M.C., Ophthalmic Specialist, Northern Army, for assistance on technical questions.

The Transactions have been printed and published by Thacker's Press and Directories, Ltd, Calcutta, also the printers and publishers of the *Indian Journal of Medical Research* and the arrangements for publication have been carried out through the office of the same Journal The experience and the work done by Mr B Bhattacharya, the Journal clerk, have been invaluable in this connection.

Thanks are also due to Messrs Thacker's Press and Directories, Ltd for their willingness to meet our suggestions and for the skill and speed with which they have carried out the work

The blocks of the photographs illustrating the exhibits of the Firms who had stalls in the Commercial Exhibition are the property of the Firms themselves Our thanks are due to them for lending these for purposes of reproduction in the section on the Exhibitions in Volume III.

T H SYMONS,
MAJOR-GENERAL, I M.S,
President, Seventh Congress, F E A T M

NEW DELHI,
December 5th, 1928

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MESSAGE

FROM

HIS EXCELLENCY THE VICEROY

TO

THE DELEGATES AND MEMBERS OF THE SEVENTH CONGRESS

It is with great pleasure and with a keen sense of the importance of the occasion that I welcome your Association to day India early recognized the possibilities of the movement which started, I understand by the enterprise of a small group of earnest workers in Manila in 1908 and has progressed until now it embraces nearly all countries of the Far East and is generally recognized as the most representative and authoritative organization dealing with the public health and diseases of warm climates We are therefore highly gratified to have the opportunity of welcoming its members to India, where there are still such great opportunities for those interested in medical research Indian representatives on your Association have been hospitably entertained in the past in Manila, Hongkong, Saigon, Java Singapore and Tokyo I trust that our guests may carry away as pleasant recollections of the Congress as our own delegates preserve of previous gatherings elsewhere

I wish your Congress all success I feel sure that the free interchange of thought and the opportunities for meeting under pleasant social conditions, workers of different nationalities and of varying experience will have a real value for those who are gathered here to day

HIS EXCELLENCY THE GOVERNOR OF BENGAL'S SPEECH AT THE OPENING OF THE SEVENTH CONGRESS.

GENTLEMEN,

I DEEM it a great privilege to have the honour of opening this Congress to-day. His Excellency the Viceroy has asked me to convey a message to you which I will now read.

(*His Excellency then read H. E. the Viceroy's Message.*)

Gentlemen, this is the Seventh Congress of the Far Eastern Association of Tropical Medicine, though it is the first to be held in Calcutta.

The history of medicine in India begins with the *Vedas*, which are believed to date back to 1500 B.C., but the best known names in connection with Indian medicine are *Sushruta* and *Charaka*, who flourished about five or six hundred years before the beginning of the Christian era.

Their writings are, I understand, still revered by many practitioners of medicine in India and all of us can unite in paying homage to these great men of old, who lived and worked before the time of Hippocrates.

The modern history of medicine in Calcutta contains some names of special interest to workers on tropical diseases. The names of Timothy, Lewis and Cunningham will be familiar to many of you. Their work was done at a time when interest in medical research was low, and so their discoveries have not received the recognition which they deserve.

You are all familiar with the epoch-making discovery which was made by Major Ronald Ross, about thirty years ago. You will be interested to see here in Calcutta the little laboratory in which he toiled and wrested from Nature her jealously guarded secret of the transmission of Malaria. It is a matter of great regret that Sir Ronald, now full of years and honours, is prevented by ill-health from being with us to-day.

You are also familiar with the work of Sir Leonard Rogers, who worked for many years in the Medical College, where many of your meetings will be held.

Sir Leonard was not merely a research worker, but was responsible for the erection of the new School of Tropical Medicine and Hygiene, in which a small band of workers are engaged in pursuing the researches which were, and still are, the obsession of Sir Leonard's life. The work done by Ross and Rogers will always be proudly remembered in India, and this school in Calcutta is a fitting and worthy monument of their labours, skill and perseverance.

There are men who are now engaged in medical research in Calcutta and doing splendid work you will see them for yourselves and I am sure that they will greatly appreciate the opportunity of exchanging ideas with fellow workers from Japan China the Dutch East Indies the Philippines Indo China the Federated Malay States and the other countries of the Far East as well as workers from America and Europe

Your presence here is most gratifying and for two reasons one is that we may show you what is being done here and what is perhaps more important that we may learn from you and obtain suggestions for the improvement of our work

Among our welcome guests are men whose names stand out pre eminently in the domain of medical discovery Drawn from all nations of the world they possess a wide and varied experience of the ravages of tropical diseases—many of them have fought all their professional lives with these enemies of humanity and in many cases have defeated and exterminated them

During your visit you will discover and appreciate the vastness and complexity of the problems which confront our workers in India and if you make your survey of India in a sympatnetic spirit you will probably realize the serious efforts which are being made in Bengal and all over India for the control of disease

From the early days of British rule in India the importance of public health was realized but the policy of Government was based on the view that it was necessary first of all to educate the people and to secure their goodwill towards public health measures For this reason attention was first concentrated chiefly on medical relief This may not have been the quickest way but it was probably the surest and safest and that the policy has justified itself is proved by a steadily growing demand not merely for doctors but also for health officers

Prevention is better than cure but we cannot force preventive measures on unwilling people any more than we can compel a horse to drink merely by bring ing him to the water

There are some hopeful signs in Bengal I am informed that thousands of people are coming for intravenous injections for the treatment of kala azar which is one of our special scourges

Inoculation against cholera is readily accepted by people who a few years ago would have resisted to the death People with early leprosy are coming forward in numbers for treatment and generally there is a gratifying increase of the receptiveness of the people for modern methods of treatment and prevention of disease Another hopeful sign of the times is the rapid rise of voluntary co operative societies for the control of malaria and kala azar the success of these is chiefly due to the efforts of a former Assistant of Sir Leonard Rogers—Rai Bahadur Dr Gopal Chandra Chatterjee

The awakening of a spirit of self help is a great advance, it greatly facilitates the work of Government agencies, and it is likely that Dr Bentley will be able to show you how rapidly the attitude of the people is changing Apathy and indiffer ence are disappearing and in many places there is an embarrassing demand for

preventive measures, especially against cholera. More inoculations against this disease have been carried out in the past few months than in all the years since the introduction of anti-cholera inoculation. If we lay stress on the hopeful signs, you must not imagine that we minimize the difficulties which still lie ahead : the obstacles to advance have not yet been swept away, but it is important that they are beginning to yield and it is likely that we are approaching a period of interest in public health, which will require even more tactful handling than the prolonged apathy of former generations.

Research work appears to have outstripped the practical application of the results of research, but we cannot afford to call a halt in research. Every new important discovery has a great value in promoting the efficiency and economy of public health measures. The recent discoveries in connection with the treatment of kala-azar have made it possible to organize a campaign against that dreadful disease, whereas a few years ago we had to look on while the people died miserably. The discoveries which remain to be made in the future will doubtless be of great value in simplifying the problems of preventive medicine and it is for this reason that the Congresses of medical research workers have been welcome guests in every country which they visited.

Such a Congress as this should be welcomed to Bengal as a relieving army to the besieged. We in this Presidency are unfortunately the victims of several virulent scourges such as cholera, which at the moment is very rife, malaria and kala-azar, and we are hopefully looking to the results of your deliberations to help us along the road towards some relief.

I beg to offer this Congress a hearty welcome to this city and to Bengal, and to express the hope that their stay here may prove enjoyable and that your memories, when you leave, will be in all respects satisfactory and agreeable.

PRESIDENTIAL ADDRESS

BY

Major General T H SYMONS C S I K H S I M S

Director General Indian Medical Service President Seventh Congress

LADIES AND GENTLEMEN

It is my duty and at the same time a great honour and privilege to extend a welcome to all who are assembled here this morning We in India realize the great inconveniences to which a large number of you have been put to enable you to leave your work and country in order to attend this conference and for this reason we are all the more pleased to see you This is the first time the F E A T M has honoured India in making it its centre of activities I can only hope that it will not be the last I can assure those who have come from afar that India is prepared to give you of its best and we hope most sincerely that you will go away with very pleasant recollections of your visit

As President of this great assembly I am sure you would like me to take this opportunity of expressing our thanks to His Excellency Lord Irwin the Viceroy of this great country for his message of welcome sympathy and encouragement which His Excellency Sir Stanley Jackson has just read out to us It is most fortunate that we should have at the head of the administration of this country a man of such sterling qualities immense capabilities and sympathetic tendencies towards our work, and we regret most sincerely, that His Excellency is not able to be here to day Our thanks are also due to His Excellency for permitting us to hold the conference dinner at his Calcutta residence viz Belvedere This concession we greatly appreciate, and consider it a great honour conferred upon us

His Excellency Sir Stanley Jackson the Governor of this Presidency, most kindly consented to open the conference and it is my pleasurable duty, Sir, to thank you on behalf of all present, not only for coming here to day and opening the conference at no inconsiderable inconvenience to yourself but also for taking such an interest in the proceedings and extending your hospitality to members at a garden party and a reception at Government House We greatly appreciate the alacrity with which you so kindly consented to preside at the conference dinner which is to be held on Saturday at Belvedere and we are also most sensibly appreciative of the honour which Lady Jackson is conferring upon us by her presence at the dinner

ultimate and successful results of his labours Ladies and gentlemen, it is men like Cragg and Stokes whom we honour and admire, and, since fate decreed that their lives should be forfeit for the work that they accomplished it will not prevent other workers putting their hands to the plough and bringing to a completion that which they had so nearly finished Those who are trying to wrest from Nature her secrets in connection with disease are invariably faced with dangerous possibilities, but they take risks knowing full well that the knowledge gained will be well worth the risk involved

This is the seventh Congress which has been held in connection with this Association The first was held in the year 1908 at Manila, the second in the year 1912 at Hong kong, the third in the year 1913 at Saigon Then there was an interval of eight years—the period of and following the Great War—before the next conference was held The resuscitation was due to the energies of the Dutch scientists in Java and naturally the conference was held in that island The fifth was held at Singapore in 1923 and the sixth in Japan in 1925

In looking up previous Presidential addresses I note there has been no uniformity in the subject selected by the various past Presidents, so with your kind permission I am going to take as my theme the principal epidemic diseases encountered in this country pointing out, where possible, what has been done and noting in passing the difficulties which are constantly with us I have ventured to adopt this method of procedure because of the importance of this country in respect of these great epidemic diseases, and, moreover, India is yearly coming more and more into the limelight of the scientific world in this respect I hope I shall be able to convince you in no uncertain manner that great difficulties beset us in tackling epidemics, yea all diseases in this great country with its large size and enormous population

When you start off on your tours next week the first thing that will strike you is the great distances which exist To give you some idea, perhaps, I may be permitted to quote a few instances taken from the railway Guide, as it will serve to bring home this fact in the most practical manner—

	Miles
Calcutta to Bombay	1,319
Calcutta to Delhi	902
Calcutta to Peshawar	1,500
Calcutta to Madras	1,032
Calcutta to Dibrugarh	830
Delhi to Bombay	865
Delhi to Madras	1,569
Delhi to Tuticorin	2,013
Delhi to Peshawar	585

Then we have Burma which is three days by sea from Calcutta.

Now, ladies and gentlemen, you will realize from what I have just read out to you that India is not a country, in the ordinary sense of the word, but is rather a sub-continent; it is in fact equal in area and more than equal in population to Europe minus Russia. If you grasp this fact you will at once see how difficult is the question of tackling all the interesting and important questions which arise in connection with epidemic diseases.

Another point—India is a country of many races, religions and languages. You may say there are many languages, religions, etc., even in Europe, but I can assure you that the North and South inhabitants of Europe are by no means so far apart as the North and South population of this country. If I were asked to point out similarities between the Pathan of north-west India and the Tamil in Tuticorin I would find it difficult to do so.

During the course of your tours I think it is more than probable that you may at times jump to the conclusion that perhaps more could have been done along the lines of public health and sanitation. I assure you that there is nobody more alive to this fact than the medical profession in India. In this connection specific difficulties exist. Practically all medical relief in this country is state aided and the State or rather multiples of States are—like most other states in the world—in a chronic condition of trying to balance their budgets. Help from private individuals, those who could afford to come forward handsomely, is not so frequent as we would wish. Moreover, when we are presented with a hospital very rarely is it endowed, so that not infrequently its utility is seriously interfered with for want of funds. Then we have the psychology of the population to consider. The average individual either through ignorance or apathy—more frequently the two combined—does not want any improvement in the standard of living. He is quite content to carry on in the same groove as his ancestors did before him, and you may take it from me, that it takes a mighty big jolt to shift him out of that rut. There are some who speak disparagingly of the work done by the medical profession in India. They either know nothing concerning the subject, or do not realize what the profession is up against. There may be instances where individuals have not perhaps given of their best; that applies to every walk in life; but, speaking as the head of the medical profession in this country, I can assure you that we are quite prepared that our work should be judged by the best of all judges and critics, viz., *time*, feeling confident that the mound of knowledge which we have helped to erect, the work which has been carried out, on occasions even with loss of life, will stand as a monument to our activities and testify to what was done to try and improve the conditions.

You will expect me to give you some idea of what has been done in this country in tackling the subject of disease. You are already aware that India is the home of many epidemic diseases—diseases which have a bearing of a world-wide nature. I have only to mention cholera and plague to create many thoughts and remind you of many incidents in connection with these two scourges. Then again India is

rife with diseases like enteric fever, malaria, venereal, kala-azar, smallpox and the like. A lot has been done and is being done to combat these diseases and when I tell you that only last February, March and April there occurred a pilgrimage at Hardwar when eight millions visited the shrine from all parts of India during a period of 90 days and only 58 cases of cholera occurred, you will at once realize how thorough must have been the arrangements, because those of you who know anything about these pilgrimages know that the material is always there and only requires the spark to bring about an enormous outbreak. I visited the town just before the most important day and was greatly impressed by the prophylactic measures which had been put into practice. Protection of such a number against cholera by inoculation was impossible, even if the pilgrims had been willing to submit to it. I have mentioned the above incident, because it demonstrates concretely the kind of problems which the Public Health Department is called upon to face in India and, incidentally, the very thorough manner in which it was tackled.

Daily numbers*
4½ lakhs on April 2nd
9 lakhs on April 13th
Actual number of epidemic diseases
74 of Smallpox
35 of Pneumonia
7 of Dysentery
168 of Diarrhœa,
58 of which proved to be true Cholera

Plague is another disease which causes us a great amount of anxiety. It was first introduced into Bombay in 1896, and, finding a suitable soil, and environments which were pre-eminently favourable for its rapid dissemination, it spread rapidly throughout the Bombay Presidency. Such a disease called for drastic measures and at the time the only one which proved efficacious was immediate and complete evacuation of the infected area. Thanks to the original work done in the Research Institute at Bombay a vaccine was discovered which has proved to be most effective as a prophylactic. Nowadays immense quantities of this prophylactic are being used annually. In the Province of the Punjab alone seven lakhs (700,000) of doses were given during 1926. This will give you some idea of the work. Such of you as go on the tour will be able to see the large scale production of this vaccine at the Haffkine Institute, Bombay.

Malaria yearly claims many victims, in fact far too many. The prevention of this disease in a country like India is a matter on which those of you who are interested will be able to take part in the discussions of the scientific sessions. We are deeply sorry not to have had Sir Ronald Ross himself to take part in these discussions, the more so in that his absence has been due to ill-health. I am glad to say however that we have with us Sir Malcolm Watson, Professor Stephens and Colonel James all of whose work on this disease is so well known.

India is a land of extremes and the variation in conditions between the monsoon and the dry season is one of our special difficulties. The age long excavations around the villages and habitations is another difficulty less known in newer lands.

* 1 lakh = 100,000

In your tour you will have an opportunity of seeing some of the anti-malarial problems and the work done and still to be done at the Imperial Capital of Delhi and some other places.

Other diseases which are very prevalent in India are ankylostomiasis, especially in Madras, Assam and the West Coast, where the climatic conditions are exceptionally favourable for its existence and spread ; kala-azar which was a great stumbling block to the profession owing to its confusion with chronic malaria before Leishman and Donovan discovered the body named after them. I can remember the days when the death rate of this disease was approaching 100 per cent, but now thanks to the discovery by Vianna of the value of tartar emetic in leishmaniasis and the recent great extension of the intravenous use of antimony salts more especially in India, this disease has now lost many of its terrors.

Leprosy, a disease concerning the treatment of which up to recent years very little more was done than what we read, was practised in the early Christian era. Now, thanks to recent investigators, much more light has been thrown on it and there is every hope that in time to come we shall assume control of this foul disease.

Relapsing fever is now attracting great attention and is proving to be a most interesting and elusive disease. Time will not permit of my dealing with tubercle or dysenteries, enteric fever and other allied bowel complaints. I am very pleased to say, however, that in this connection we have with us at this Congress Prof. Shiga, whose name is a household word with all of us and Dr. D'Herelle, the discoverer of that mysterious principle the bacteriophage now receiving so much attention in many parts of the world.

Venereal disease has attracted special attention during the past few years. A special commission from England sent out under the auspices of the British Social League last cold weather, travelled throughout India and Burma. Their report was most interesting, and I sincerely hope that the recommendations which it embodied will be put into practice by all the Governments concerned. I am glad to be able to welcome in this respect among our numbers Prof. Hata, who with Prof. Ehrlich was responsible for that great boon to humanity, salvarsan, and all that went with its discovery.

We have in India a Central Research Institute located in the hills at Kasauli and numerous other institutions of a like nature scattered throughout the country. There is now this very excellent Tropical School of Medicine here in Calcutta. We have a bacteriological service and an organization and constitution for research which we have found very valuable. The work done by officers of this country has a world-wide reputation. What Leonard Rogers has done for cholera, Ross and Christophers and others for malaria, Liston, Haffkine, Mackie and others for plague, Muir for leprosy, Donovan, Patton, Mackie, Knowles, Napier, Shortt and Smith and others for kala-azar and Harvey, Brown and Iyengar for vaccine

therapy, Vandyke Carter, Mackie, Cragg, Cunningham and others for spirochætal disease is so well known that it is unnecessary for me to dilate upon it Their work requires no praise from my humble lips, even if I were able to find words in which to do them justice

Before I conclude I must say a few words about the medical work done which does not come under the classification of epidemics and public health Our hospitals, although some of them are not so up to date as we would wish are very fine buildings and have been built to suit the climate of the country There is any amount of good work being carried on in the surgical and medical wards of these hospitals and if it does not come into the public eye like our public health problems I assure you the work is no less important You will have an opportunity of visiting our Presidency town hospitals and colleges and will, I have no doubt, form your own opinion as a result of your visit

We are particularly proud of the work done in connection with eye diseases which are so prevalent The names of Elliot Smith Kirkpatrick Herbert and Wright are well known to you Also in the ophthalmic hospital and school in Madras we feel we have an institution, which of its kind, is second to none I would also mention, that those of you who elect the southern tour, will find in Madras a maternity hospital and school which through the tireless energy of the late Major General Sir Gerald Gifford who was in charge of the hospital for many years can stand comparison with any similar institution—no matter where it be

Special measures in connection with tropical diseases are much the same as in other countries except that in India there are a very large number of stone cases in connection with which the name of Freyer stands out pre eminently Elephantiasis, upon which disease a paper will be read at this Congress and in connection with which the late Colonel Maitland of Madras did so much pioneer surgery

Intestinal lesions demanding surgical interference are mostly connected with the appendicular and gastro duodenal trouble, for which in one large institution a very large number of short circuits are done annually

The treatment of tropical abscess of the liver, so called, has undergone a complete change during the past 30 years Thanks to the work done in this connection by Rogers The needling for a hepatic abscess has almost become an operation of the outpatient department, a praiseworthy advance on the days when we opened and drained the abscess thereby running the risk of secondary infections which were so frequently followed with a fatal result

I could go on giving instances of the change and improvement of the work done in our hospitals *ad infinitum* but must stop for fear of wearying you with too many details

Gentlemen, we are carrying on the good work in this land of India We are aware that the field is large—I might say immense In the face of great difficulties

which are ever present we mean and are trying to place this sub-continent in its proper place in the world of scientific medicine and we hope when we leave that those who follow will see that the position is maintained.

Ladies and gentlemen, I have finished. I trust as a result of our deliberations during the next few days some new light on disease—more especially tropical disease—will be elucidated, and if this be so, the Congress will not have been held in vain. I wish the Congress every success.

SPEECH

BY

The Hon'ble Khan Bahadur Sir MUHAMMAD HABIBULLAH SAHIB BAHADUR K C I E

Member for the Department of Education Health and Lands Government of India

AT THE

General Business Meeting of the Seventh Congress

GENERAL Symons Your Serene Highness and Delegates to the Seventh Congress of the Far Eastern Association of Tropical Medicine

I must in the first place express my regret that I was unable to be present at the inaugural meeting of the Congress Pressure of important business at Delhi robbed me of the opportunity of joining in the first welcome I avail myself of my presence in your midst to day to echo the sentiments expressed in the message of His Excellency the Viceroy which was conveyed to you by His Excellency Sir Stanley Jackson and to express the hope that your stay in the second city of the British Empire has been interesting and agreeable That it has been strenuous I can easily infer from your programme of which I have seen a copy and from the summary of your transactions which your energetic secretary handed to me To those of you who propose to visit other centres of medical and scientific research in India I wish a pleasant and instructive tour to those who must return from Calcutta to their official homes I wish god speed To all of you whether delegates from abroad or from the various parts of India I express the thanks of the Government of India for the contribution which you have made by your meetings and discussions to the promotion of medical science and of friendly understanding between men engaged on a common beneficent task

Ladies and Gentlemen I utter no mere empty platitude of politeness when I say that I have followed your activities with the keenest interest Though a layman it is my proud privilege to day to be in charge of the medical and public health portfolio of the Government of India That imposes on me an official obligation to follow as best I can the endeavour and achievement of men engaged in the fields of medical administration and research But there is also a personal side to my interest Throughout the active portion of my life I have been intimately concerned with the administration of medical relief and sanitation First, as the civic head of the town of my adoption in the Madras Presidency,

then as the principal civic executive of the metropolis of that Presidency, and subsequently in succession as a member of the Provincial and Imperial Governments, I have had to concern myself with measures designed to combat disease and alleviate human suffering. This long experience and association have made administration of the subject, which is your life's work, more than just a dry duty to me.

I shall not presume, Ladies and Gentlemen, to assess the technical value of the work which you have accomplished during your present session in Calcutta. The list of the questions which you have discussed is long, their scientific aspect to a non-scientist like me an esoteric mystery ; their analysis or appraisement a task beyond my competence. But, after glancing through the summary of your proceedings and listening to your resolutions, I find that grim diseases, such as plague, cholera, malaria and kala-azar, which from time to time ravage this country, have been claiming your attention. I am confident that the light, which investigators from abroad attending this Congress have shed on the problems connected with these forms of human affliction, will prove of the utmost value to our own workers. I also trust that an account of our methods, and first-hand experience, however slight, of the procedure, technique and scope of our inquiries in the domain of tropical diseases, will prove of some help to them. For we have, alas ! only too many opportunities and ample material for work in this field and I may, in all modesty, but with due regard to their achievement, claim that by our pioneers in medical research, the opportunity has been well and wisely used to the benefit of humanity, and the advancement of science. The names of Ross and Rogers and Cragg—I must spare those present here to-day, the blushes which are the physical reaction of true workers to praise—are not only worthy of my tribute but are guarantee of the claim which I have made on behalf of the noble band of the servants of medical science in India. Nor must I omit mention of that great Indian, whose researches in the field of plant life have opened up fresh and limitless avenues of speculation, of inquiry and of practical achievement to doctors, no less than to biologists. For, is not the problem confronting both, one of solving the mystery by which the creative energy that we comprehensively designate life suddenly or slowly freezes into the inertness that is called death ? The door leading to such solution may be remote and the master-key yet undiscovered. But I may state with some degree of confidence that among the torch-bearers who have helped to illumine the path, the name of Sir Jagadish Bose will rank high.

And now, Ladies and Gentlemen, lest I seem guilty of prolix, though patriotic, panegyric, let me change the theme. I have spoken so far on the aspect of your work which belongs to part (c) of Article 2 of the objects of the Association, viz., the development and diffusion of scientific knowledge. I shall now speak of another aspect of equal importance—the promotion of friendly intercourse between scientific men. To my mind, Ladies and Gentlemen, that is as much a necessity of the future as its beginning is one of the auspicious and distinctive features of our 20th century civilization. To the Far Eastern Association of Tropical

Medicine belongs the credit of first making such intercourse a reality The League of Nations, to whose initiative in the sphere of international co operation the world owes so much, and the Rockefeller Foundation whose truly catholic generosity has rendered immense service to the progress of medical science, have stimulated and accelerated its beneficent development We in India are willing and ready to play our part in the scheme of co operation by intercourse That was one of the motives which led the Government of India to decide to invite the Association to hold its seventh session on Indian soil In the very near future we hope to hold an interchange of health officers under the auspices of the League in this country Next year we trust the League may find it possible to send their Commission of malarial experts to India I need not remind the Congress that we have been participants in past gatherings of the Far Eastern Association of Tropical Medicine It must also be known that India is a member of the International Health Office in Paris and that at present her Public Health Commissioner has a seat on the Health Committee of the League of Nations and on the Advisory Council of the Bureau of Epidemiology at Singapore These are a few concrete instances of our desire for co operation by association and intercourse If more opportunities for co operation arise I am sure India will not be slow to respond to the call of service

But I have another motive in dwelling on our readiness for intercourse There is an impression in some quarters that as a country where certain diseases are endemic, we are doing little to combat them or to ensure that infection does not spread from our shores to other lands You have been in Calcutta during an epidemic of cholera which for the time of the year was considered by our experts to be serious Some of you may have seen what is being done to cope with the outbreak The fact that it has been rapidly brought under control is proof of the efficiency of the health organization of this great city Lieut Col Russell who comes from my old Presidency has given you some idea of what is being done in Madras Those of you who undertake any of the tours that have been arranged will get an idea of corresponding activities in other parts of the country I speak of these things not in any spirit of boast but to support the claim which I now propose to put forward that in India we have nothing to hide It is not suggested that the limit of what is desirable or possible has been reached In a country greater in size than the whole of Europe without Russia and with a population of over three hundred millions even a small measure of progress represents endeavour which would be equal to the achievement of perfection elsewhere I confess that a great deal remains to be done and we need all the light and inspiration that the example of other countries can give us But we plead not guilty to any suggestion that endeavour has not been quickened by the presence of danger or the breath of science

I do not wish you Ladies and Gentlemen to disperse to day with the impression that complacent egotism is the keynote of our attitude towards the problems which disease and the effort to prevent and fight disease present As I have

already said, we seek light and inspiration from every quarter. Recently, the Government of India have decided to appoint a committee to inquire into the working of their existing organization of research and to make recommendations with a view to the establishment of a central institute with whose aid schemes of investigation now in progress in different parts of the country may be co-ordinated, and fresh avenues of inquiry explored. Your distinguished colleague, Sir Walter Fletcher, has kindly agreed to preside over the committee, Col. James of the British Ministry of Health, who was once with us in India and who has since his retirement from the Indian Medical Service won fresh laurels in other fields, has also, I am glad to say, found it possible to agree to serve on the committee which will include two distinguished workers with recent Indian experience, viz., Dr. Row and Col. Christophers, F.R.S. The Government of India trust that, their labours may impart to medical research in India fresh impetus and definiteness of direction.

Ladies and Gentlemen, I must not detain you too long. You have worked hard and still have a busy round of engagements to go through. It would be inconsiderate of me to weary you with my discourse. I shall offer one word of explanation for the prominence which I have given to research in my remarks. It is because I feel that in the field of medical research, international co-operation can, at this stage, be most fruitful. And gatherings like the Congress provide the right opportunity and atmosphere for exchange of ideas and comparison of methods, for analysis of data and for synthesis of experience. Personal relations are established, personal affinities discovered, and misunderstandings of methods and objective dispelled. Men separate with greater clarity of vision and strength of purpose to renew their tasks. May the seventh Congress of your Association conclude its labour in the consciousness of much good accomplished and with faith renewed.

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SECTION III

Plague, Cholera, Dysentery, Sprue and Intestinal Infections, Bacteriophage, Leprosy, Tuberculosis, Bacteriology

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Medicine and Dermatology.

Monday, 5th December, 11 A.M. to 1 P.M.	*Chairman.*—Major H. Stott, I.M.S. (United Provinces). *Rapporteur.*—Dr. J. M. Henderson (Bengal).
Monday, 5th December, 2 P.M. to 4 P.M.	*Chairman.*—Dr. J. M. Henderson (Bengal). *Rapporteur.*—Dr. J. M. Henderson (Bengal).
Tuesday, 6th December, 10 A.M. to 1 P.M.	*Chairman.*—Dr. W. B. A. Moore (Hongkong). *Rapporteur.*—Dr. J. M. Henderson (Bengal).

Pathology.

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Surgery.

Monday, 5th December, 10 A.M. to 1 P.M.	*Chairman.*—Major-General G. Tate, V.H.S., I.M.S. (Bengal). *Rapporteur.*—Lieut.-Col. E. W. C. Bradfield, C.I.E., I.M.S. (Madras).
Monday, 5th December, 2 P.M. to 4 P.M.	*Chairman.*—Col. Phya Damrong (Nai Cheune) (Siam). *Rapporteur.*—Lieut.-Col. E. W. C. Bradfield, C.I.E., I.M.S. (Madras).

Ophthalmology.

Tuesday, 6th December, 10 A.M. to 1 P.M.	*Chairman.*—Col. C. R. Bakhle, K.H.P., I.M.S. (Punjab). *Rapporteur.*—Major E. O'G. Kirwan, I.M.S. (Bengal).
Thursday, 6th December, 10 A.M. to 1 P.M.	*Chairman.*—Lieut.-Col. W. V Coppinger, I.M.S. (Bengal). *Rapporteur.*—Major E. W. O'G. Kirwan, I.M.S. (Bengal).

Gynæcology and Diseases of Pregnancy

Tuesday, 6th December, 2 P M to 1 P M	*Chairman*—Dr Kedarnath Das, C I E (Bengal)
	Rapporteur—Dr Margaret I Balfour, C B E (Bombay)
Thursday, 8th December, 10 A M to 1 P M	*Chairman*—Dr Kedarnath Das, C I E (Bengal)
	Rapporteur—Dr Margaret I Balfour, C B E (Bombay)

Mental Hygiene and Psychiatry

Thursday, 8th December 10 A M to 1 P M	*Chairman*—Dr B Mahamad Usman (Mysore State, B India)
	Rapporteur—Lieut Col O Berkeley Hill, I M S (Bihar & Orissa)

Radiology

Thursday, 8th December 2 P M to 4 P M	*Chairman*—Dr E Jourdran (French Indo China)
	Rapporteur—Lieut Col J A Shorten I M S (*Retd*) (Bengal)

Dentistry

Monday, 5th December, 11 A M to 1 P M	*Chairman*—Mr J E Gill (Bengal)
	Rapporteur—Mr J E Gill (Bengal)

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Wednesday, 7th December, 10 A M to 1 P M	*Chairman*—The Hon ble Dr A L Hoops (Strait Settlements)
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Wednesday 7th December, 2 P M to 4 P M	*Chairman*—H S H Prince Vallabakara, (Siam)
	Rapporteur—Lieut Col G G Jolly, I M S (Burma)
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	Rapporteur—Lieut Col G G Jolly, I M S (Burma)
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	Rapporteur—Lieut-Col G G Jolly, I M S (Burma)

Maternity and Child Welfare.

Friday, 9th December, 10 A.M. to 1 P.M.	*Chairman.*—Dr. A. C. Scott, W.M.S. (B. India). *Rapporteur.*—Dr. Ruth Young, W.M.S. (B. India).
Saturday, 10th December, 10 A.M. to 12 NOON.	*Chairman.*—Dr. A. C. Scott, W.M.S. (B. India). *Rapporteur.*—Dr. Ruth Young, W.M.S. (B. India).

SECTION I.

MEDICINE AND DERMATOLOGY

THE IMPORTANCE OF THE RECOGNITION OF MIXED MULTIPLE AND SECONDARY INFECTIONS IN THE TREATMENT OF TROPICAL DISEASES

BY

LIEUT.-COL. F. A. F. BARNARDO, C.I.E., C.B.E., I.M.S.,
Principal, Medical College, Calcutta

THIS paper calls attention to the frequency of mixed, multiple and secondary infections in tropical countries not only in purely tropical diseases but also in diseases not peculiar to the tropics, and to the importance of their recognition not only for diagnosis but also for rapid and effectual treatment. MONDAY DEC. 5TH 11 A.M. TO 1 P.M.

In temperate climates we have been accustomed to recognize without special comment the occurrence of the simple mixed infection of diphtheria and streptococci in infections of the throat and, in the later stages of phthisis, of the secondary infections of streptococcal or staphylococcal invasion of the affected parts of the lungs whose vitality has been depressed by Koch's bacillus. Ready recognition then, is not fraught with difficulty in such cases as they are mostly well defined, and, in most other diseases that we meet in temperate climates, we have only a single pathological factor. In the tropics, however, there is a very different tale to tell.

If we take Bengal, we find probably 80 per cent of the population are suffering from hookworm, certainly 80 to 90 per cent have suffered at one time or other from malaria, 50 to 60 per cent at least are suffering from infection by round worms or small worms. All of these may be contributing pathological factors to assist the specific agent to obtain its hold on the human subject. It is thus in the tropics we find that mixed and multiple infections are the rule rather than the exception, and, if I may use the word 'secondary' to be additional to the words 'mixed or multiple,' I think that the most critical of you will not consider, after hearing some of my observations especially on typhoid fever, that I have exceeded my justification. The practitioner in the tropics is thus confronted every day with many and varied concurrent disease factors in a single patient who presents himself for treatment. Further, these multiple and secondary infections are not only apt to obscure the

diagnosis, but, as naturally follows, will complicate the successful treatment of cases, which at first sight, appear to be quite straightforward in origin.

As a result of the last two years' experience here, we have been able to analyse some 250 cases by means of laboratory diagnosis only as under :—

A.		Simple Infections	40
B.	I.	Mixed Infections	22
	II.	Multiple Infections	88
	III.	Secondary Infections	100

I am of opinion that there are at least these three distinct groups of confusing clinical pictures which may be caused by a multiplicity of pathogenic factors in diseases that present themselves to us who are in daily practice in the tropics.

I. *Mixed Infections.*

There are cases of mixed infection where we must recognize the importance of the part played by any one organism in enabling another specific organism to obtain a foothold in the body—in other words to become pathogenic at all. I refer to the unusual, though at present little understood, sudden virulence of cholera; also to the inability of the tetanus bacillus to proliferate invariably in the tissues, obviously requiring another friendly organism to aid in its growth, and to the inability of the diphtheria bacillus to grow on healthy mucous membrane, etc., etc. We have little information how far symbiosis may initiate or increase the pathogenicity of one bacillus or how it may be retarded, although it is obvious that such phenomena do occur.

II. *Multiple Infections.*

Here two infective agents are at work at the same time in their attack on the body without their pathogenicity being much affected by each other. In this manner two definite infections, both pathogenic, are concerned at the same time in the definite attack on the system. Under this group will come :—

1. Typhoid fever with ankylostoma.
2. Typhoid fever with round worms.
3. Typhoid fever with malaria.

In these cases something abnormal is noted in the clinical picture. The temperature is abnormally high, 104°-105°F. with rapid pulse unlike that of typhoid fever. If the condition is recognized and treatment be successfully adopted towards the helminthic or malarial factors, a marked drop in temperature follows and the remainder of the illness proceeds along its usual course of the enteric type.

4. Typhoid with monilia.—This case presented an unusual clinical picture until the demonstration of monilia in the sputum cleared up the diagnosis of the multiple infection.

5. Diphtheria with streptococcal infection has already been referred to as common in temperate climates and may be regarded as *mixed* rather than *multiple* in nature.

I would specially draw your attention to the virulence in the tropics of the streptococcal group of organisms whether of the enterococcal or of the hæmolytic type. Their prevalence and persistence extra-corporeally in the heat and moisture around us must, I think, be recognized and held responsible for the prevalence of pyorrhœa and the frequency of bowel infections by this group.

We notice in Calcutta a great number of cases of simple fever, accompanied with or without sore throat (the point of entrance into the body of the invading organism perhaps from the tonsil or from the teeth), are followed by a slight cough with some signs of capillary bronchitis and in a few days the clinical picture is directed to the kidneys. Albumen and casts are found on examination, while a blood culture shows the presence of streptococci. No fewer than 27 per cent of cases with the above clinical picture have given cultural growths of streptococci in the blood-stream. The European who complains that he has been too long in the tropics and is unable to carry out his day's work without stimulant or rest after 3 or 4 o'clock, will almost invariably show the existence of streptococci in the stools. The exhaustion of the thyroid in its attempts to neutralize the bacterial toxin within the intestine and the slow neutralization of the adrenal amine by this streptococcal toxin completes the exhaustion of two of the most important members of the endocrine board of directors, which exhaustion is expressed in the generic term 'Tropical wind-up' or 'Neurasthenia.' These are characterized by low blood pressure, absence of fever or streptococci in the blood but their presence in the stools.

III. *Secondary Infections.*

Conditions exist under which one infection supervenes on the primary factor as a secondary infection, when the resistance of the body has been lowered by the first factor. The invasions under this head commonly met with here are as follows :—

1. Kala-azar succeeded by typhoid fever.
2. Typhoid fever with a secondary infection by kala-azar.
3. Typhoid fever with a secondary infection by streptococci.
4. Typhoid fever with a secondary infection by *B. coli.*
5. We have cases in the wards to show you of kala-azar with hookworm ; kala-azar with round worms ; kala-azar with tuberculosis ; kala-azar with malaria, and kala-azar with amœbiasis and with *B. coli.*
6. Amœbiasis of the liver with a secondary coccal infection causing abscess formation.
7. Cases of diabetes where tuberculosis of the lung is a secondary invasion rendered possible by the break-down of the defence mechanism of the body as instanced by the glycosuria. Such cases give rise to the greatest difficulties to the practitioner, for one disease demands restrictions of diet and the other disease demands liberality of diet in all its proximate principles.

The occurrence of gangrene and boils in diabetes showing a break-down of the body resistance to staphylococci is also too well known to be more than referred to.

8. Tuberculosis and malaria. Where in the case of an ordinary tubercular infection an exacerbation of fever up to 104°-105°F. causes the blood to be examined and the presence of malarial parasites is revealed. If the malaria is checked and eradicated by appropriate administration of quinine, the clinical picture assumes the usual course of tubercular infection.

9. Filariasis with the secondary infection or streptococci.

It is not well understood how the periodical fever that one experiences in filariasis is the result of streptococcal infection throughout the lymphatic channels. It has been suggested that these cocci get into the sheath of the adult filaria and that the inflammatory and consequent secondary changes are due to this agent. Much has still to be worked out on this line and it is hoped that much will be added to our knowledge by the surgical section which is dealing with this disease. Much can, however, be done for the comfort of the patient by preventing a recurrence of this secondary infection by anti-streptococcal remedies. That such is possible is the result of definite experience, because there are many people who harbour filaria with many free embryos in the blood and yet are free from symptoms.

10. Amœbiasis as a secondary infection. The actual incidence of amœbiasis in the tropics is very much greater than those shown by acute or chronic dysentery. In fact, the greater number do not show any symptoms of dysentery at all, but generally symptoms of progressive ill health, poor digestion and what is termed the sluggish liver commonly met with in the tropics.

Emetine is now enjoying a reputation of being a general hepatic stimulant in the tropics, probably by its specific action on amœbæ present but not demonstrated. Amœbiasis is, undoubtedly, one of the commonest causes of hepatitis.

Investigation into the cause of many cases of asthma has elucidated the fact that, at least, a fair number of these cases are associated with chronic amœbiasis or helminthiasis. The process seems to be one of primary loss of integrity of the intestinal mucous membrane by these agents allowing the intestinal streptococci to flourish and produce the anaphylactic phenomena by their continued assault on the adrenal amine.

11. The occurrence of dysentery followed by a general streptococcal infection through an unhealthy mucous membrane. I would draw your attention to the strain on the kidneys and would advise close attention to them which tropical conditions demand.

IV. *Doubtful Cases.*

In addition to the conditions already referred to, we may have multiple infections where one factor is latent or dormant or may actually be antagonistic.

(*a*) Conditions where one factor is *latent* or *dormant :* one of our most difficult problems in the tropics.

Bacterial and specific agents may be present in the blood or ambulant in the body, though at the moment not having assumed any specific virulence. Pathological examination reveals their presence and, on discovery, the intruder may be mistaken for the root factor of the disease.

(1) Colon bacilli are often present in the urine without any intention of mischief making whatever The preparation of a vaccine and its administration will often do nothing but exaggerate the symptoms as the organisms were not present in a pathogenic capacity

(2) Malaria parasites are frequently found in the blood but are non pathogenic for the time being

(3) So too common invaders of the mouth and intestines may be present, even of the streptococcal group without apparently assuming for the moment any pathogenicity

(*b*) *Antagonisms* —Conditions where two pathological factors are present at one time but are antagonistic to each other one retarding development of the other

A specific instance of this is malarial infection and the specific lues as in cases of G P I I would invite your attention to the rarity of occurrence of G P I and locomotor ataxia in our indigenous population in India probably due to the very high malarial taint existing in the majority of the residents

It will be easily seen that the therapeutic measures undertaken in such cases will demand the greatest care and experience in generalship and control in order to achieve the most uniformly successful results Recovery at the earliest date cannot be assured without a full recognition of the numberless multiple and secondary infections which attack the human resident of tropical countries

I would draw the most undivided attention of all practitioners in the tropics to the importance of periodical and systematic pathological examinations especially laying stress on the adaptation of the clinical picture to the laboratory findings For example I would specially bring before you the procedure adopted here during the course of a case of typhoid fever If we regard the normal temperature of a case of enteric to be somewhere about 102° 103°F as the optimum temperature at which the body finds that the anti bodies can be elaborated then the existence of a fever one or two degrees in excess of this figure say 104° 105°F suggests at once the presence of a multiple or secondary infection At once every possible laboratory aid is sought to aid us in its discovery and from our experience here the secondary or multiple factor is generally discovered if we search long enough and carefully enough with such indications It will be remembered that few tropical diseases can cause symptoms and a clinical picture sufficiently pathognomonic to be definitely recognized without the aid of the laboratory and the closest co operation of the clinician and pathologist is the only method of safety On the whole I am inclined to accept as a factor no finding of the laboratory if it appears that the organism discovered is not likely to have contributed to a part of the clinical picture

Two axioms stand out as the result of twenty six years clinical experience

1 Recognize the possibility of multiple infection as a possible cause of a confused clinical picture

2 Recognize the possibility of secondary infection and anticipate it by preventive measures

These two axioms will, I hope, soon be acknowledged as the elements of the principles and practice of medicine in tropical countries.

DISCUSSION.

Major H. Stott, I.M.S. (United Provinces): We are all very grateful to Col. Barnardo for impressing on us the importance of mixed and multiple infections in the tropics. The frequency of such mixed infections is probably within the experience of all of us who have to deal with the sick in warm climates.

Especially is this so in the case of syphilis concomitant with some other infection which, on account of its acute manifestations, is attracting the physician's main attention. This acute infection is frequently very resistant to treatment and its symptoms are often made far more severe until and unless the underlying syphilitic infection is recognized. It is, therefore, becoming more and more the routine to have a blood Wassermann reaction performed in all cases in which syphilitic infection seems possible in the pathological make-up of the case.

Rai Bahadur Upendranath Brahmachari (Bengal): Mixed and secondary infections in certain diseases in the tropics are important from the following standpoints:—

(1) They may give rise to difficulties in the diagnosis of the original disease.
(2) They may give rise to difficulties in the treatment of the disease.
(3) They may add to the gravity of the disease and thereby influence the prognosis seriously.

(1) *Difficulties in the diagnosis of the original disease.* Let me take up the case of kala-azar. A focus of tuberculosis may be undetected and the patient may be treated for kala-azar with large doses of antimony with little or no benefit and sometimes the tubercular process may be made worse by antimony treatment. I have, therefore, held that, if during the course of antimony treatment of kala-azar, there is a persistent hectic rise of temperature in spite of the diminution of the size of the spleen, if there is no improvement in the general condition of the patient in spite of the increase in the leucocyte count, then tuberculosis should be suspected. An attack of typhoid fever may complicate the diagnosis, and may give rise to grave symptoms which may not be so much due to kala-azar but to the infection with the typhoid bacillus. An attack of malaria may be overlooked and the case treated as a case of kala-azar. Recently I met with a case of kala-azar with severe malignant tertian infection in which the patient was being treated for one disease.

B. coli infection may sometimes make the diagnosis of kala-azar extremely difficult due to development of leucocytes and fever with multiple rises during the 24 hours.

An attack of septic infection may complicate the disease and give rise to a leucocytosis which may throw difficulty in the way of the diagnosis of the disease.

A *B coli* infection in the course of malaria may be undetected and the patient may be treated with massive doses of quinine which may not cure him. Cases of internal syphilis may sometimes be complicated by malaria and the patient may be treated only for malaria and still may suffer from fever which subsequently is cured by anti-syphilitic treatment.

DISSEMINATED SCLEROSIS AMONGST INDIANS IN INDIA.

BY

LIEUT.-COL. CUTHBERT A. SPRAWSON, C.I.E., M.D., F.R.C.P., I.M.S.,
Professor of Medicine, Lucknow Medical College, Lucknow (United Provinces).

IT is my belief that disseminated or multiple sclerosis of the nervous system is a disease very rare amongst Indians in India, and is perhaps even non-existent amongst them. Very little has been noted hitherto on the geographical or racial distribution of this disease. In the classical work of August Hirsch(1) of Berlin, 'The Handbook of Geographical and Historical Pathology,' there is no mention of disseminated sclerosis. Nor is there reference in Clemow's(2) work on 'The Geography of Disease.'

Since it is less than 90 years since disseminated sclerosis was first separated as an entity by Cruveilhier and Carswell and only 65 years since the disease was first adequately described by Vulpian and Charcot, one is not surprised that its geographical distribution has not yet been worked out, and this particularly because it seems to be an uncommon disease in some of the more civilized countries where medical textbooks are written, for instance in the United States of America.

Risien Russell(3) wrote in 1910 that the disease is said not to be so common in America as in England by Dr. Byrom Bramwell: but this statement is disputed by Dr. E. W. Taylor of the United States.

J. E. Wilson(4) of the United States wrote later 'While we cannot ascribe any numerical preponderance to any given race, it is a fact that cases are more numerous among the older civilizations of Europe than in this country, two per cent in European statistics, as compared with less than one-half of one per cent in this country (U. S. A.). By some this difference is ascribed to our lack of skill in its identification.'

Church and Peterson(5) of the U. S. A. consider the disease not very common, apparently even in Europe: because Uhtoff in six or seven years could gather only about 100 cases from all the hospitals and clinics of Berlin.

As opposed to this, however, Grainger-Stewart(6) found himself able to collect records of 1,451 in-patients alone suffering from disseminated sclerosis who had

been treated in the National Hospital in Queen's Square, London The proportion *is briefly put by Jelliffe and White(7), thus*

In the Vanderbilt Clinic in U S A 27 cases of disseminated sclerosis amongst 18 000 cases of nervous disease = 0 001 per cent

Against this we have in England two per cent of disseminated sclerosis amongst all cases of nervous disease (Bramwell, Williamson)

We may conclude therefore that there are differences in the world distribution of the disease and that it is more common in England than in the United States

Other recent writers(8) also point out that the disease is common in Great Britain France and Germany, and apparently especially so in Switzerland

As regards India, my own experience after 27 years in the Indian Medical Service including 16 years dealing only with clinical medicine in a large hospital in Lucknow and 2½ years as a consulting physician in Mesopotamia, is that I have not yet seen a case of disseminated sclerosis in an Indian I have however seen two cases in Europeans in India who presumably had brought their disease into the country

I do not know what has been the experience with this disease of physicians in Bombay, Calcutta, Madras but I hope that at this conference we may learn their views

It is right to say that I have on several occasions had cases diagnosed as disseminated sclerosis shown me both in India and in Mesopotamia by other physicians but that I have not concurred in their diagnosis The cases shown me have usually been in my opinion cases of hysteria When previously I have expressed my belief in the rarity or absence of this disease in Indians I have occasionally *been met by an offer to lead me straight to a typical case I have not yet been* convinced

Apart from functional nervous disorder, which is most usually confused with disseminated sclerosis, other possible multiple lesions or small formations of fibrous tissue in the central nervous system must be distinguished from true multiple sclerosis For instance small multiple tumours lesions of endarteritic origin syphilitic or otherwise, or inflammatory processes in the brain or cord must be *separated and their possibility considered in a suspected case*

Moreover, the case or cases shown to demonstrate the existence of disseminated sclerosis should be of typical clinical character and possess the pathological evidence now considered necessary By typical clinical character I mean that the case should not be one of the less common types We are all familiar with the classical spinal cord form of the disease, where the cerebrum often shows signs of partial involvement as well Less well known types where hemiplegia or ocular or *mental symptoms are the chief features, or purely cerebral or cerebellar forms* certainly exist but can hardly be used, without accepted post mortem evidence, to prove the existence of a disease, the occurrence of which is in doubt amongst Indians in India •

The laboratory evidence required, either with or without morbid anatomical changes in the nervous system, is to be found in the cerebro-spinal fluid. This is a negative Wassermann reaction combined with little or no increase in the percentage of albumin or in the cell contents. Until the typical clinical phenomena combined with such characteristics in the cerebro-spinal fluid have been shown, I shall doubt the occurrence or question the frequency of disseminated sclerosis amongst Indians in India. It is an impossible thing at present to deny the existence of the disease amongst Indians, and a bold thing even to state its rarity. It is always possible to think that the cases have not come my way though they may be there all the time, or yet to question my diagnostic ability if I have met them. But I state the case as I have found things and I am further emboldened to do so by a similar statement made by Steiner, a German worker in the far east. A recent paper(8) quotes Steiner as stating that disseminated sclerosis is unknown in China and Japan, very rare in South America, and rare in Italy. I have been unable to find so entire a statement in Steiner's original papers : but I have found one(9) where he writes that the disease is very rare in China, Japan and South America.

Steiner(9) suggests that the differing incidence of the disease may depend on different racial characteristics or else on the differences in the distribution of the carrier of the infection. It is generally admitted now that disseminated sclerosis is due to an infection, and clinical, serological, pathological and experimental evidence have been adduced in support of that belief. Some, Steiner included, have found spirochætes, which may be the cause, and the transmission by stinging insects is believed in by many. Whether their beliefs are correct or not, it appears more reasonable to regard the rarity of the disease in Indians as due to lack of opportunity for infection and not to any racial peculiarity. It is possible that Indians in Europe would find themselves equally susceptible with the surrounding races. The remarks in this paper, therefore, regarding the non-occurrence or rarity of disseminated sclerosis must be taken as applicable to Indians in India only, and possibly only to Indians in the United Provinces, where most of my own observations have been made.

REFERENCES.

(1) Hirsch, August (1886) .. .. 'Handbook of Geographical and Historical Pathology.' Translated and published by the Sydenham Society.
(2) Clemow, Frank G. (1907) .. .. 'The Geography of Disease.'
(3) Allbutt and Rolleston (1910) .. .. 'System of Medicine.'
(4) Wilson, J. E. (1916) .. .. .. 'Diseases of the Nervous System,' U. S. A.
(5) Church, A. and Peterson, F. (1919) .. 'Nervous and Mental Diseases,' U. S. A.
(6) Grainger-Stewart (1921) .. .. 'The Oxford Medicine.'
(7) Jelliffe and White (1923) .. .. 'Diseases of the Nervous System,' U. S. A.
(8) Douglas McAlpine (1927) .. .. Address on Disseminated Sclerosis. *Brit. Med. Jour.*, February 12.
(9) Steiner, G. (1926) .. .. .. Multiple Sklerose, ihre Ätiologie und Behandlung. *Jahrest. f. arztt. Fortbild*, XVII, 1—6 (Abstract.)

DISCUSSION

Dr B Sahai (Gwalior, B India) It is a matter of very great satisfaction to hear from such a high and distinguished authority that there is a disease after all which, though it depends on an infective process, is entirely non existent in India I entirely agree with his remarks The commonest mistake in diagnosis which I have very often come across is to confuse the symptomatology of disseminated sclerosis with that of post encephalitic Parkinsonism Cases of Parkinsonism are very common in Central India, and I am sure in other parts also, and bear a close resemblance, on superficial examination only, to disseminated sclerosis

Rai Bahadur Upendranath Brahmachari (Bengal) I speak with a good deal of diffidence when I say that I differ from such a high authority as Col Sprawson I have met with some cases in the Calcutta Medical College Hospital and at the Campbell Medical School showing all the classical symptoms of disseminated sclerosis e g nystagmus intentional tremors scanning speech and increased knee jerks Whether these are cases of true disseminated sclerosis or not, I cannot say, as I had no opportunity of making a post mortem examination of the spinal cord in these cases

Dr Lal Behari Ganguly (Bengal) During the course of 16 years' charge of the nervous diseases ward of the Campbell Hospital, I am sure I have come across about eight cases of what were, to all intents and purposes, proved cases of disseminated sclerosis

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Lieut Col F A F Barnardo, I M S (Bengal) Was of opinion that the disease was confined to Europeans and he had not in 26 years seen a case which he was satisfied was a definite example of the disease among his Indian patients He had two cases of disseminated sclerosis at present under treatment, but both are Europeans

The landmark and boundaries of disseminated sclerosis were difficult to set forth It might be very largely a question of diagnosis and classification

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I had at least three cases coming at first with very vague symptoms which were diagnosed *hysteria*. Subsequently, when these came in 1½ to 2 years after, more definite signs had developed with ocular change diagnosed by ophthalmoscope (pallor of the disc) These were all *males*

The laboratory evidence required, either with or without morbid anatomical changes in the nervous system, is to be found in the cerebro-spinal fluid. This is a negative Wassermann reaction combined with little or no increase in the percentage of albumin or in the cell contents. Until the typical clinical phenomena combined with such characteristics in the cerebro-spinal fluid have been shown, I shall doubt the occurrence or question the frequency of disseminated sclerosis amongst Indians in India. It is an impossible thing at present to deny the existence of the disease amongst Indians, and a bold thing even to state its rarity. It is always possible to think that the cases have not come my way though they may be there all the time, or yet to question my diagnostic ability if I have met them. But I state the case as I have found things and I am further emboldened to do so by a similar statement made by Steiner, a German worker in the far east. A recent paper(8) quotes Steiner as stating that disseminated sclerosis is unknown in China and Japan, very rare in South America, and rare in Italy. I have been unable to find so entire a statement in Steiner's original papers : but I have found one(9) where he writes that the disease is very rare in China, Japan and South America.

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REFERENCES.

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(4) Wilson, J. E. (1916) .. .. .. 'Diseases of the Nervous System,' U. S. A.

(5) Church, A. and Peterson, F. (1919) .. 'Nervous and Mental Diseases,' U. S. A.

(6) Grainger-Stewart (1921) .. .. 'The Oxford Medicine.'

(7) Jelliffe and White (1923) .. .. 'Diseases of the Nervous System,' U. S. A.

(8) Douglas McAlpine (1927) .. .. Address on Disseminated Sclerosis. *Brit. Med. Jour.*, February 12.

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I also saw cases with well developed signs of disseminated sclerosis among Indians (including ophthalmoscopic ocular changes). Though it must be admitted that such cases are not too common, it cannot be said that such cases do not exist.

Dr. B. L. Majumdar (Bengal): I do not agree with the observations of Col. Sprawson that this disease does not occur in India. While working in the out-patients' departments of the Medical College, Calcutta, Campbell Hospital, Calcutta, and the Mitford Hospital, Dacca, I have occasionally met with cases of disseminated sclerosis which have been diagnosed as such from the presence of intention tremor, nystagmus, scanning speech and exaggerated knee-jerks. Of course, the cerebro-spinal fluid was not examined in any of these cases.

A PROPOS D'UN CAS DE 'BURNING OF THE FEET'

PAR

MAJOR V. G F. LABERNADIE,
Chef du laboratoire de Pondichery, Establissements français dans l'Inde

EN 1832, le Bureau Médical de la Présidence de Madras offrait un prix de 500 Rs à l'auteur du meilleur mémoire sur 'le Rhumatisme et sur l'affection nevralgique qui en est accidentellement la conséquence et que les natifs nomment "Burning of the feet"'

Les troupes de la Compagnie en effet venaient, durant les campagnes en Birmanie, d'être trés éprouvées par une curieuse maladie, qui paraissait nouvelle et qui genait considérablement l'activité des troupes Après quelques prodromes vagues, des douleurs névralgiques et articulaires apparaissaient dans les membres inférieurs et bientôt, au niveau de la plante des pieds, une hypersensibilité avec sensation de brûlures rendait la marche impossible Cette affection non fébrile avait une allure épidémique mais ne frappait pas les habitants des régions ou les soldats hindous avaient été introduits, elle guérissait spontanément au retour dans le pays natal

'John Grant Malcomson, chirurgien aide-major de l'armee indigene de Madras, fut l'auteur couronné, et ses mémoires sur le Béri béri, le Rhumatisme, le "Burning of the feet" furent imprimés en 1835 par ordre du Gouvernement'

Les auteurs qui ont écrit sur le même sujet Waring, McKenna, Playfair(1) sont d'accord avec Malcomson pour incriminer, au moins en partie, l'alimentation des troupes en campagne et l'opinion générale tacite ou explicite fut qu'il s'agissait de béri béri dans ces cas de 'Burning of the feet'

A vrai dire, ce symptôme curieux n'était pas inconnu en Europe et justement aux armées. En 1762, a Savigliano (Piémont) il regna une affection, qui s'étendit en 1806 aux troupes en campagne dans le Padouan, caractérisée par des douleurs subites et aigues sous la plante des pieds avec chaleur locale, sans rougeur ni enflure, on l'appelait pedionalgie(2) ou cheiropodalgie, quand les mains étaient aussi atteintes

Plus tard, toujours en Europe, le même symptôme, accompagné d'autres manifestations il est vrai, est signalé à diverses époques—En 1828, Alibert, Chomel, Genest, Chardon fils, le décrivent sous le nom 'd'acrodynie' ou de 'mal des pieds et des mains' sévissant soit dans un asile de vieillards, soit dans la population libre

de la région parisienne—En 1861, Tholozan(3) rapporte une pseudo-épidémie analogue survenue en 1854 sur les troupes opérant en Crimée. Dans la deuxième moitié du XIXè siècle il n'est plus signalé en Europe que des cas sporadiques d'acrodynie.

Aux Indes, au contraire, l'expression 'Burning of the feet' était devenue courante dans le vocabulaire médical et on la retrouve souvent dans les rapports annuels du Service de Santé de Pondichéry, notamment dans le mémoire de Collas(4) qui traite en 1861 cette maladie par la quinine, et dans les compte-rendus des Officiers de santé de la même région. L'un d'eux, actuellement en retraite, et qui était chargé des Prisons vers 1888 se souvient fort bien avoir souvent observé à cette époque des cas de 'Burning of the feet' soit dans son service, soit en ville et de les avoir vu guérir par 'l'amélioration du régime alimentaire' et les sédatifs nerveux.

Puis le silence se fait, du moins à notre connaissance et ce terme médical disparait de la nomenclature vers 1900, sans renseignements explicites sur son étiologie, le béri-béri lui même paraissant oublié.

Il y a quelques mois nous avons eu l'occasion d'observer dans notre service une femme qui offrait un cas typique de 'Burning of the feet.'

S...., 40 ans, musulmane de race dravidienne, entre le 9 Mars 1927 pour 'névrite des extrêmités des membres'—Elle se plaint surtout de la plante des pieds où elle éprouve des fourmillements et brûlures au repos ; la marche est difficile, car, dès qu'elle pose les pieds par terre elle sent comme des épines s'enfonçant dans la chair. Aussi marche t-elle en s'appuyant sur le bord externe des pieds dont la peau est cornée tandis que sous le reste de la plante, l'épiderme est devenu mince et délicat. Pas de lésions dermatologiques—La sensibilité à la piqûre est augmentée sous la plante, diminuée sur le dos du pied et le tiers inférieur de la jambe—Réflexes rotuliens, achilliens paresseux—Pas d'atrophie musculaire.

Aux mains : aucun signe objectif—la malade accuse des fourmillements. Bon état général—coeur, poumons, foie, rate normaux. Cette femme a eu 10 grossesses, il lui reste 9 enfants vivants. Elle a beaucoup de travail dans sa famille mais pas plus que les autres ménagères de la région de Pondichéry qu'elle n'a jamais quitté. Rien de particulier dans son alimentation dont la base est, comme dans la contrée, le riz, les menus grains, carry, poisson, viande, etc. Elle n'a jamais mangé de maïs. Elle ne boit pas d'alcool. Elle n'a fait récemment aucune maladie grave. Elle ne connait pas dans son voisinage d'affection analogue à celle dont elle soufre.

Examens de Laboratoire.—*Urines :* ni sucre, ni albumine.
Selles : oeufs d' ankylostomes et de trichocéphales.
Sang : Pas d'hématozoaires du paludisme—formule leucocytaire normale.
Bordet-Wassermann : positif.

Ponction lombaire : 0 gr. 40 d'albumine par litre dans le liquide céphale-rachidien.

Traitement —Cure de chenopodium Frictions sous les plantes avec onguent mercuriel belladoné—Injections intramusculaires de Luatol Poulenc* du 16 Mars au 18 Mai 16 injections (0 10) 2 fois par semaine Après ces deux mois aux plantes l hyperesthésie à la piqure les sensations de brulures ont disparu les fourmillements ont diminué la marche normale est possible sur de petits parcours—Reflexes toujours paresseux l hyperesthésie du tiers inférieur des jambes a diminué—B Wassermann—négatif Malgré nos instances la malade quitte le service Elle revient un mois après dans le même état sauf les sensations de brulure qui ont réapparu

Reprise du traitement antisyphilitique du 15 Juin au 11 Août la malade reçoit 0 80 gr de Luatol en 8 injections semi hebdomadaires et à la même cadence 6 injections de Quinby (1 gr 80)†—B W toujours négatif

Après ce traitement les sensations de brulure ayant disparu la malade debarrassée du symptome le plus genant nous quitte encore une fois sans qu on ait pu pratiquer une nouvelle ponction lombaire

Etant donnes les examens de Laboratoire et l action du traitement spécifique voilà un cas de Burning of the feet qui est simplement l expression d une *polynévrite fruste d origine syphilitique*

Il ne peut s agir de la seule syphilis dans tous les faits que nous rappelions plus haut mais leur trait commun nous parait etre le syndrome polynevritique qui lui a une étiologie très variée Le beri beri au debut invoqué et avec raison diverses carences le paludisme expliquent parfaitement l allure tantot sporadique tantot épidémique de polynévrites sevissant sur des groupes debilités (guerres famines mis re épidémies antérieures de cholera de grippe etc) les intoxications par des végetaux avariés ou veneneux par l arsenic peuvent emprunter le meme aspect Dans l Inde il serait légitime de rendre en outre une part étiologique au diabete qui y est si commun Enfin comme l indique notre observation il ne faut pas oublier, en Asie ou ailleurs la polynevrite syphilitique qui peut avoir comme symptome subjectif dominant le Burning of the feet

INDEX BIBLIOGRAPHIQUE

(1) ABBATUCCI (1911) — *Ann Hyg Med Col* p 8-8

( ) LITTRE et GILBERT BAILLIERE (1908) — *Dict de Medecine* Article Pedonalgie

(3) LEHU et ARDISSON (19-7) — *Une Maladie qui ressuscite Paris Med* p 111

(4) ABBATUCCI — *loc cit*

DISCUSSION

Col Froilano de Mello (Portuguese India) remercie le Dr Labernadie de son interessante conférence Burning of feet est un symptome disons meme un syndrome Sa pathogénie est évidemment une polynévrite dont les causes sont les

* Tartro bismuthate de potass[illegible]
† Iodo-bismuthate de quinine

plus varieés. A celles signalées par l'auteur on doit ajouter une autre très fréquente à l'Inde Portugaise. C'est l'insuffisance thyroïdienne survenue souvent chez les femmes enceintes après accouchement et les cliniciens obtiennent de très bons resultats avec l'opotherapie thyroïdienne. La malaria est bien connue du peuple qui l'appelle en Cancona ' banant-rôg'. L'orateur a aussi eu des cas de ' Burning of feet ' causés par une alimentation carencée en vitamine.

Lieut.-Col. C. A. Sprawson, I.M.S. (United Provinces) : Agreed that this symptom is of very varied origin and is very common and often due to mild pyrexia.

Major H. Stott, I.M.S. (United Provinces) : ' Burning of the feet ' is occasionally an early sign of diabetes mellitus, as was first pointed out to me by Sir Norman Walker. I imagine in such cases the burning is due to paræsthesia due to slight degeneration of the peripheral nerves.

SYPHILIS HERÉDITAIRE DEUX LOCALISATIONS RARES

PAR

MAJOR V G F LABERNADIE,

Chef du laboratoire de Pondichery, Establissements français dans l Inde

LA syphilis hereditaire est particulierement frequente aux Indes et revet toutes les apparences decrites par les classiques—Ayant eu l'occasion de constater deux formes que nous croyons peu fréquentes, nous avons pense devoir les communiquer au 7e Congres

I *Arthrite temporo maxillaire droite*

D , fils de V , caste Vannia, garçon de 5 ans, entre dans notreservice de l hopital de Pondichery le 28 Mars 1927—Depuis quelques jours a peine, il ne peut plus articuler les machoires dont l inferieure est deviee a gauche au point que la deuxieme incisive inferieure droite vient au contact de la premiere incisive superieure gauche donnant l apparence d'une luxation temporo maxillaire droite

Cette articulation est peu douloureuse a la palpation, quoi qu'un peu tumefiee, mais les mouvements de bas en haut ne sont genes que dans la mesure ou la diduction normale les limite ordinairement

Pas de fievre Bon etat general – Rien de special du coté de la peau et des muqueuses de l'appareil locomoteur

Dents d'Hutchinson—Voute du palais ogivale

Bordet Wassermann positif

Traitement—Bismuth intramusculaire sous la forme de Luatol Poulenc (tartro bismuthate de Na et K) 0 grm 10 deux fois par semaine

14 Avril—amélioration la déviation de la machoire est moindre B Wassermann toujours positif

28 Avril—l'amelioration continue les machoires s'articulent presque normalement

4 Mai—Etat normal—B Wassermann negatif—L'enfant a reçu 1 grm de Luatol , on continue cependant le traitement jusque fin Mai ou l'enfant est reclamé par ses parents (Dose totale de Luatol 1 grm. 50)

Il nous est ramene en Juin, la deviation de la machoire s' étant reproduite — L'enfant depuis cette epoque ne vient qu'irregulierement a la consultation externe recevoir des injections de Bismuth, cependant le symptome a rapidement cede et fin Septembre la guerison apparente se maintient

La localisation de la syphilis héréditaire au niveau de l'articulation temporo-maxillaire parait rare, en tout cas nous ne l'avons trouvée signalée ni par Fournier, ni par Hallopeau, Leredde Gaucher, etc.

Elle est de même rare dans la syphilis tertiaire, que l'héréditaire semble avoir pris pour modèle—Dans une statistique de Fournier portant sur 51 cas, les arthropathies temporo-maxillaires ne figurent que deux fois(1) Le même eminent syphiligraphe étudiant les fréquences par appareils des manifestations de la syphilis tertiaire(2) signale que les articulations ne viennent qu'en seizième ligne.

Aussi nous a t-il paru intéressant de publier cette observation d'une localisation sans doute aussi rare dans la syphilis héréditaire que dans la syphilis tertiaire où elle n'atteint que 4 pour-cent de l'anté pénultième catégorie des appareils atteints.

II.—*Spina ventosa syphilitique.*

Le 25 Juin 1927, entre dans notre service de l'hôpital de Pondichéry un enfant de 40 jours pour 'paralysie des membres inférieurs' La mère nous raconte que cet enfant est né normalement et n'a présenté aucun symptôme inquiétant jusqu'au 15è jour—Depuis cette époque, il ne cesse, ou prèsque, de crier, surtout la nuit, et ses jambes sont rapidement devenues inertes, tandis que quelques doigts enflaient aux deux mains.

La palpation des membres inférieurs est très douloureuse, particulièrement au tiers inférieur des fémurs et au tiers supérieur des tibias où l'on sent surtout à gauche une zone tuméfiée, mais où il n'y a ni crépitation ni mobilité anormale (pas de décollements épiphysaires).

A la main droite les trois doigts moyens, à la main gauche et à un moindre degré l'index et le medius présentent l'aspect classique du spina-ventosa : doigts en bouteille, la tumeur siègeant surtout à la première phalange, peau luisante, aspect soufflé —L'os participe à la déformation, renflé en fuseau lui aussi. Les métacarpes sont normaux ; orteils et métatarses indemnes (Plate I).

Pas de lésions cutanées ou muqueuses, actuellement ou antérieurement (ni pemphigus ni coryza en particulier) Splénomégalie legère mais nette ; coeur, poumons normaux.

Dans le cas de cet enfant, l'héredo-syphilis était nettement accusée par la pseudo-paralysie de Parrot typique qu'il présentait et fut confirmée par un Bordet-Wassermann positif fort, chez le père et chez la mère.

Quant au spina ventosa si typique lui aussi, comme il est rare dans la syphilis héréditaire précoce surtout dans les premiers jours de la vie, on pouvait à la rigueur supposer que cette lésion était de nature tuberculeuse. Et cette hypothèse risquait de mettre en évidence un des si rares cas d'hérédité tuberculeuse vraie par transmission placentaire du virus.

Mais cliniquement les parents ne présentaient aucun symptome de bacillose et leur sérum est resté négatif à la si sensible réaction de Valtis (fixation du complement en présence de l'antigène methylique tuberculeux).

Plate I



Il ne pouvait donc s'agir d'heredite tuberculeuse jointe a une hérédité syphilitique, celle ci seule était en jeu

D'ailleurs l'enfant mourait subitement trois jours apres, confirmant le diagnostic etiologique par ce supreme symptome tenu pour caracteristique par les pediatres et les syphiligraphes

INDEX BIBLIOGRAPHIQUE

(1) Fournier (1909) Cité par Gaucher Syphilis des viceres et de L appareil locomotor Doin p 587

(2) *Idem* (1902) Cite par Berdal Traite pratique de la syphilis Maloine p 744

THE SCOPE OF DIGITALIS IN THE TROPICAL HEART OF BENGAL.

BY

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Having had frequent occasions when my opinion was invited regarding the administration of digitalis in heart affections prevailing in the tropical climate of Bengal during the course of my practice as a cardiologist in this city, and having been faced with many difficulties in giving an opinion on such occasions, I started a series of investigations extending over some years which has given birth to the present paper.

It is a matter of common knowledge that before any opinion can be hazarded about the efficacy of digitalis in any particular case, the condition of the myocardium must be very carefully considered beforehand. I therefore thought it necessary first to study the condition of the myocardium of Bengalees, both in health and in various diseases, and then tried to ascertain the sphere of usefulness of digitalis in these conditions from the data obtained from my clinical experience with this drug. I began my observations with a clinical study of the Bengalee heart consisting of a searching examination of the heart of 50 healthy Bengalee males and females between the ages of 25 to 30 years. This period I preferred as I found this to be the golden age in the life of the Bengalee who outlives his period of struggle, settles down in life and is at liberty to choose his diet and to have his own way of life. Any observations carried out on younger subjects, specially upon the student folks of Bengal, I consider unsound, as people at that age, specially the students, are yet in their period of struggle and live mostly in messes partaking of scanty meals. I tried to get as many of the rich and upper and lower middle-class people in this series of cases as possible, as they are the people who form the bulk of our private patients. They numbered 40 out of a total number of 50 cases in this series. The remaining 10 I selected from menials representing the poor classes; but I selected Bengalees from these, otherwise I might have included poor people

TABLE I

Site of the Impulse	*Heart Sounds*	*Exercise Tolerance*	*Pulse*	*Blood Pressure*	*Orthodiagram*	*Electro cardiogram.*
Judging from the knowledge gained from recent observations upon the exact position of the impulse, I found that its position in all of my cases was within normal limits but its thrust upon the chest wall was so feeble in some cases, that *its position could* not be located without exercise and in those who were very obese, without asking them to bend forward In almost all cases of Europeans, the impulse was visible to the naked eye *and its impact on* the chest wall fairly satisfactory	The 1st sound was in many cases weak and there were tonicity murmurs present in some of them In Europeans, the heart sounds were mostly normal In some cases, the 1st sound at the apex and 2nd sound at the base were found slightly accentuated	Exercise tolerance was found insufficient in many cases In Europeans exercise tolerance was mostly satisfactory	The rate of the pulse varied between 72 and 80 in the majority of cases but the tension was feeble In Europeans the rate of the pulse varied between 68 and 74	On an average the systolic blood pressure varied from 100 to 105 m m of mercury In Europeans it varied between 125 and 130 m m of mercury	The lie of the heart irrespective of the type of person, namely, asthenic, hyposthenic, sthenic, hypersthenic, was more vertical It looked more funnel shaped than triangular The lie of the European heart was oblique and the greatest transverse diameter was at least 2 5 c m greater than that of the Bengalee	The final deflection 'T' was of lower height and amplitude. In Europeans, the 'T' waves were more marked

from other provinces who constitute the majority of the servant population in the city of Calcutta.

I must confess that in carrying out these investigations I thought little of the poor classes as such, not because their circumstances were straitened but for many weighty reasons. In the first place they seldom come to a private practitioner practising the allopathic system of medicine, unless in a moribund condition, on account of the costly treatment in comparison with their average monthly wage. In the second place those that come under hospital practice are mostly people belonging to provinces other than Bengal. Lastly, even in hospitals no careful observations can be made upon them as they resort to the hospital when they are physically incapable of walking about and leave it secretly the moment they feel better to go to their homes in the salubrious climate of Behar and the United Provinces which they consider the speediest way to recovery.

The height of these cases varied between 5 feet 4 inches and 5 feet 8 inches and their weight ranged between 9 and 10 stones. Control examinations were carried on 25 Europeans, mostly belonging to the mercantile firms of Calcutta who came out to India for a specified number of years according to their contract and were almost of the same age, height and weight as the Bengalees. There were cases, however, where the figures obtained from a Bengalee fell short of or exceeded by one or two inches, or by 3 or 4 pounds, respectively, those obtained from an European. As a matter of fact I had difficulty in some cases in selecting a Bengalee of the same height and weight as an European, the Bengalees being found usually shorter and their weight not conforming to their height, the reason being that those who were in affluent circumstances indulged themselves in over-eating, and were necessarily corpulent, while those that were poor were for obvious reasons lean and thin. No chest measurements could be given owing to these difficulties but it was found that in a Bengalee of the same height and weight as an European, the chest of the Bengalee was narrower by an average of about 3 inches than the European. Of the Bengalees almost all were Hindus, and of the Europeans all British. Only those men were included in this series who were found on a thorough clinical examination to possess a normal heart and whose other organs were also examined thoroughly and were found normal in every way. The results of this clinical study of the heart in this series of cases are given in Table I.

I next studied the morbid anatomy and histology in a series of 44 hearts obtained from the Medical College police morgue belonging to persons mostly between the ages of 20 and 40 who had been enjoying perfect health and died suddenly as the result of accident. They were mainly Hindus. Control study under similar circumstances was attempted on European hearts, but not more than 2 could be collected in spite of every endeavour as European post-mortems due to accident were very rare. These hearts were preserved in Zenker and sections were made at the Calcutta School of Tropical Medicine under the direction

of Col Acton, who very kindly examined the slides These results have been embodied below as follows —

Macroscopic —

Europeans	*Bengalees*
The European heart was heavier in weight larger in size of good colour firmer in consistency and thicker in musculature The weight of the heart in both the cases was 12 ozs The one was aged 25 and the other 23	The Bengalee heart was decidedly lighter in weight smaller in size pale in colour flabby in consistency and thin in musculature A little excess of fat was visible in a few cases and there were occasional patches of milk spot present The weight of the heart was about 7 oz on an average in the females and 9 ozs in the males Openings of the coronary vessels were atheromatous in some cases

Microscopic —

On longitudinal section the fibres appeared larger the stain deeper the nuclei less in number and not so prominent nor so large On transverse section the fibres did not exhibit the fibrils	Out of sections of heart obtained from 13 healthy Bengalees who met with accidental deaths examined microscopically almost 50 per cent showed the typical brown degeneration piling up about the poles of the nuclei On longitudinal section the muscle fibres were smaller they possessed numerous nuclei which were very prominent the fibres were stained palely and on transection the fibrils were well seen

The above tables clearly indicate that in about 50 per cent of the so called healthy people of Bengal even the most vital organ, namely, the heart like the other organs and tissues of their bodies such as the flesh the blood, the liver the stomach, the intestines, the eyes, the spleen, the gums, the tonsils, the skin, the testes, etc , is defective *It is true that the weakness of the heart revealed by the* various methods of clinical examination recorded above may be ascribed to defective development due to lack of physical education coupled with a tiresome climate and a diet deficient in, and in many cases almost devoid of, milk (for what meat is *to the European and the Mohammedan, milk is to the Hindu*), although it is difficult to see how these factors explain the degeneration about which I have spoken above

These investigations, therefore, confirm my previous observations about the Bengalee heart published in the July 1925 number of the *Indian Medical Gazette* I then observed The majority of the people of Bengal suffer from one of the most serious types of heart lesion, namely, myocardial disease We all know by this time that the endocardium constitutes anatomically a very small portion of the heart and that the prognosis of endocarditis depends largely on the condition

of the myocardium. It is this vital structure thatis the seat of disease in the overwhelming majority of the cases seen in Bengal. It is not strictly speaking a myocarditis, but a degeneration of the myocardium absolutely independent of coronary sclerosis and this degeneration is responsible for the early death of its people.

I next attempted to ascertain the relative frequency of valvular disease in the two great cities of London and Calcutta. The figures below represent the total number of acquired valvular diseases of the heart taken from the reports of the National Hospital for Diseases of the Heart, London, and the Calcutta Medical College Hospitals for three consecutive years from the year 1924 and treated as in-patients in these hospitals.

It would have been better to compare these figures with the total population of these two cities also, but as it was not known how many of the patients came from districts outside Calcutta such a comparison was not made.

Year.	National Hospital for Diseases of the Heart. Total number of acquired valvular diseases of the heart.	Calcutta Medical College Hospitals. Total number of acquired valvular diseases of the heart.
1924 ..	204	53
1925 ..	153	53
1926 ..	175	46

I now produce below a comparative statement about the varieties of the acquired valvular lesions of the heart from the statistics of the same hospitals for the same period.

Year.	National Heart Hospital.		Medical College Hospital.	
	Mitral diseases.	Aortic diseases.	Mitral diseases.	Aortic diseases.
1924 ..	106	30	43	10
1925 ..	79	41	46	7
1926 ..	111	27	41	5

As ætiology is no less important than pathology in deciding about rational therapeutics, I have next attempted to find out the ætiology of the cardiovascular diseases seen in the two premier cities of London and Calcutta as follows —

Total number of cardiovascular diseases treated in the National Hospital London	Rheumatic	Syphilitic	Cause unknown	Myocardial affection
350	112	31	94	57
Total number of cardiovascular diseases treated in the Calcutta Medical College	Mitral regurgitation and stenosis	Aortic regurgitation	Myocardial affection	
400	168	40	92	
Total number of cardiovascular diseases treated in the heart clinic of the writer	Chronic endocarditis		Myocardial affection	
446	Rheumatic 17 Syphilitic 4 Degenerative 8 Idiopathic 6 TOTAL 35		174	

I believe there remains very little doubt in one's mind after studying the above tables that valvular diseases of the heart are comparatively uncommon here as compared with London that mitral diseases considerably outnumber the aortic in both the places and that myocardial affections are much commoner here than in London Some authorities have held that syphilis is the main cause of the valvular diseases seen in Calcutta, on the strength of post mortem examinations on patients from hospitals My observations on private patients as well as on hospital patients, as is evident from the tables submitted above, do not bear out such a statement Whether this is due to the small proportion of poor people in my clinics or due to the increasing number of middle-class men who nowadays resort to hospital or to the better treatment of syphilis is more th[illegible] I can say at present

I next record the common cardiac complications met with during the [illegible] of the specific infectious diseases prevalent in Bengal I hold that my [illegible] is the commonest complication and is seen clinically as dilatation of th[illegible] either left or right, and as heartblock, the latter being notably com[illegible] pneumonia, dysentery, typhoid fever and influenza Next in order [illegible] comes the *acute endocarditis* Here also the rheumatic element prepo[illegible]

other infections. Thus in a series of 28 cases of acute endocarditis published by me, rheumatic fever was the causative factor in no less than 16, influenza in 5, small-pox in 3, measles in 2, diphtheria in 1 and typhoid fever in 1. The last complication in order of frequency is *pericarditis.* Here again the clinical findings, like the causative factor of the valvular diseases, do not tally with the post-mortem observations. For, although clinically one seldom comes across pericarditis as a complication of the various specific infectious diseases, and, in those few that are seen, the rheumatic factor outnumbers other infections, one not infrequently comes across pericarditis and patches of milk spots at the autopsies even in so-called healthy hearts seen in medico-legal post-mortems.

My figures dealing with this complication were as follows :—

Out of a total of 7 cases, due to rheumatic fever, 4 ; complicating Bright's disease, 2 ; due to puerperal infection, 1. In my clinics not a single case of acute endocarditis and pericarditis was found as a complication of pneumonia and, to my mind, pneumonia just as in other clinics affects the heart musculature more than it affects either the lining membrane, or the covering membrane of the heart.

I feel sure practitioners in this province must have been struck with the readiness with which the rate of the pulse steadily goes up, its tension steadily down, and the cardiac sounds progressively grow faint and feeble till they are inaudible or the first sound is replaced in some cases by a murmur and the throbbing of the heart is ultimately stilled during the course of an acute infectious disease. I thus observed during the course of my preliminary observations on acquired diseases of the heart and aorta more than two years ago that 'it thus happens that infections common to all climates such as influenza, pneumonia, enteric and diphtheria which are notorious in attacking the cardiac musculature when they visit the Bengalee houses find a ready soil and often create disaster. The Bengalees thus die prematurely as the result of such infections as compared with the Europeans who, as a rule, stand infections better and attain to a much older age.'

Such being the condition, normal and abnormal, of a tropical heart, let us now see how it behaves with digitalis. I will not tire your patience by giving a lengthy account of the clinical trial of digitalis. The table I have submitted below (Table II) shows how digitalis discharged itself in this clinical trial on seven cases. Three of these cases were from my private clinics and the remaining four from my hospital clinics.

The last case was a female named Mrs. Row whom I treated at the Howrah General Hospital (when I was on the staff of that hospital as a cardiologist) for mitral stenosis. I have not included her in the above table because I could not furnish a complete record of her case. In the beginning she reacted very well with small doses of tinct. digitalis (B.P.) 10 minims three times a day, but after several attacks of heart failure she required massive doses of the tincture and in

TABLE II

No	Name, Race, Age of patient and occupation	Cardiac lesion present	Amount in drms necessary to get the patient under digitalis	Number of days of digitalis administration to get the patient under	Brand used	Where treated
1	Pannalal Ghose Hindu, male, 25, clerk working in a mill at Budge Budge	Mitral stenosis and auricular fibrillation	3 drms to reduce the pulse from 160 to 80 per minute	3 days dose 60 minims daily	Tinct digitalis Standardized P D	At Budge Budge
2	Shikharilal Banerjee, brother of Dr Fanindra Nath Banerjee, Hindu, male, 47 years manager in a zemindar's estate	Mitral regurgitation	2 drms to reduce the pulse from 120 to 80 per minute	4 days, dose, 30 minims daily	Digifortis P D	Duff Street, Calcutta
3	Dwijendra Nath Bose, Hindu, male, 30, pleader	Mitral stenosis and regurgitation	3 drms to reduce the pulse from 106 to 80 per minute	4 days, dose, 45 minims daily	Tinct digitalis P D	Nabin Sarkar's Lane, Calcutta
4	Shaik Nauna, Mohammedan, male, 48, occupation unknown	Aortic regurgitation and stenosis	4 drms 40 minims to reduce the pulse from 96 to 72 per minute	7 days, dose, 40 minims daily	Do	Calcutta Medical School Hospitals
5	Md Salim, Mohammedan, male, 12, tailor.	Mitral stenosis and regurgitation	4 drms 40 minims to reduce the pulse from 86 to 70 per minute	7 days, dose, 40 minims daily	Tinct digitalis B P	Do
6	Sundarlal, Hindu, male, 45, domestic servant	Mitral stenosis and regurgitation	11 drms to reduce the pulse from 100 to 80 per minute	21 days dose, 40 minims daily	Do	Do.

spite of it she was on the verge of death and was once saved by intravenous injection of strophanthin. Nothing could permanently benefit her, however, and she ultimately died.

From most of these cases and from observations on many similar cases which I have not recorded here from considerations of time and space, it would appear that in valvular diseases of the heart accompanied with a high ventricular rate, even when associated with a normal rhythm, digitalis reacts fairly well within 96 hours of its first exhibition by the oral route with an average daily dose of about 45 minims, and the reaction is mostly cardiac in the beginning. It must be admitted, however, that the behaviour of this drug depends largely upon the condition of the myocardium. Like mercury in syphilis, digitalis is unfortunately very seldom regularly taken by patients in this province after they are brought under its influence during the first attack of heart failure, with the inevitable consequence that the cardiac failures recur until at last the cardiac mechanism is fully exhausted and gives no response whatever may be the dose of digitalis and whichever may be the route of administration. This is one of the reasons why small doses are so successful in better class people who form the bulk of private patients and who are more careful and follow medical advice better than the lower classes who even to this day constitute the majority of hospital patients of this province.

When the pulse rate was more than 140 (and such a rate is very rare in this country) 30 minim doses of the tincture, three times a day, was the maximum limit I prescribed and I had no occasion to exceed this dose. Besides the tincture I have used strophanthin, Guy's pill, digifortis and very rarely Nativelle's granules of digitalis (White). To me the B.P. tincture as it is stocked in ordinary chemists shop appeared as potent as any other patent brand, although I must confess that, in order to be up to date, I prescribed Park Davis' preparation largely among my private patients. It is my well considered opinion that heroic doses are not only unnecessary but very often harmful to a Bengalee heart, and I have seen cases where digitalis has produced irregularities of the pulse and untoward reactions which eventually terminated fatally. We should never forget that digitalis is a poison and may react upon systems other than the heart. Like some remedies employed in general practice by the intravenous route, intravenous injections of drugs belonging to digitalis group, such as strophanthin, have lately become the fashion in the practice of cardiology in this city. I take this opportunity of condemning this method of administration as the urgent indications justifying such a method, viz., a ventricular rate above 170 is very rare nor are the gastro-intestinal symptoms of heart failure where such a method is beneficial common in Bengal.

If I am to give an unbiased opinion as regards the sphere of usefulness of digitalis as a therapeutic agent in this province I must say that the drug has got a different sphere of action from that in other countries, as the very conditions in which it is specific, viz., rheumatic infection of the heart and auricular fibrillation

PLATE II.



M. M. 30 Wt. 11 oz | E. M. 23 Wt. 12 oz | H. M. 25 Wt. 9 oz

Naked-eye appearance of English, Hindu and Mohammedan Hearts. (Obtained from Medical College Police Morgue.)

spite of it she was on the verge of death and was once saved by intravenous injection of strophanthin. Nothing could permanently benefit her, however, and she ultimately died.

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PLATE II



M M 30
Wt 11 oz

E M 23
Wt 12 oz

H M 25
Wt 9 oz

Naked-eye appearance of English, Hindu and Mohammedan Hearts. (Obtained from Medical College Police Morgue.)

PLATE III



Fig. *a*.—Longitudinal section through European Heart showing large fibres and less nuclei. (Objective 1/6 X Eye piece 6)



Fig. *b*.—Transection through Bengalee Heart. The fibrils are well seen. (Objective 1/6 X Eye piece 6)

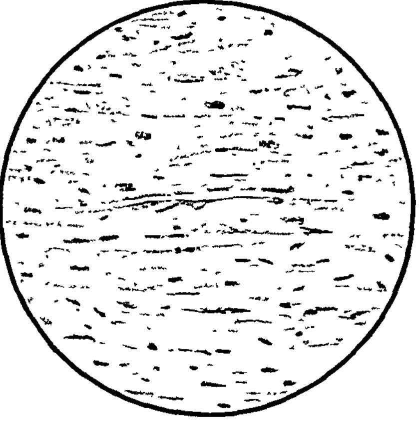


Fig. *c*.—Bengalee Heart showing slender fibres and greater number of nuclei which are very prominent. (Objective 1/6 X Eye-piece 6)



Fig. *d*.—Fibro fatty heart of a Bengalee female aged [illegible] obtained from Police Morgue. (Objective 1/6 X Eye piece 6)

PLATE IV.

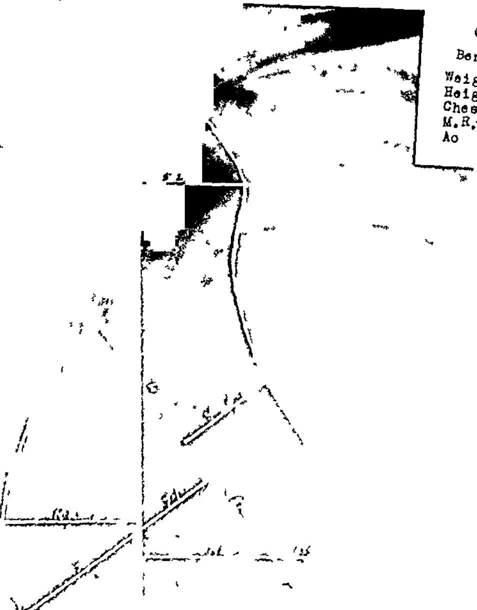


Micro-drawing from Sections of Healthy Bengalee Hearts obtained from Police Morgue, showing the Brown Degeneration. (Objective 1/6 × Eye piece 6)

ORTHODIAGRAM.

European (English).

Weight .. 10 st.
Height .. 5 ft. 7 in.
Chest . 36 inches.
M.R.+M.L. – 12.2
Ao = 5.2


ORTHODIAGRAM.
Bengalee (Hindu):
Weight .. 9 st. 2 lbs.
Height .. 5 ft. 6½ in.
Chest .. 34 inches.
M.R.+M.L. = 10.4
Ao = 5.2

are infrequent in this land In the various chronic myocardial affections I have found it decidedly inferior to a system of graded exercise and tonics like iron and strychnine The results I obtained from its exhibition on these myocardial disorders and on many cases of tachycardia did not justify the high hopes with which I employed it as most of these conditions were due to focal infections As I pointed out in the epidemic dropsy conference at the Calcutta Medical Club, digitalis failed in my hands to reduce the rapid rate of heart to the desired speed either during the course of, or during convalescence in the epidemic dropsy cases I believe the embarrassment of the heart in this acute infectious disease is due mainly to mechanical causes, viz accumulation of fluid in the lung tissue itself within the bundles of the muscle fibres of the heart within the pleural cavity and even within the pericardium

For the above reasons therefore the activities of digitalis in the hands of a specialist practising in Bengal are limited but it has got a greater scope in the hands of the general practitioner I consider its application rational in cases of specific infections where as pointed out above the heart muscle often becomes damaged and dilatation sets in with a weak systole and a small fluttering pulse In this condition I have often advised the attending physician to give small doses of the tincture 7 to 10 minims three times a day, and to continue it till the rate of the pulse corresponds with the height of the fever Its beneficial effects should be judged by directly auscultating the heart when it is often seen that the systole has gained in strength owing to its administration In the presence of an infection with fever, however, its effect should on no account be judged from the rate of the pulse very soon after its administration as it takes some time to make an impression on the pulse While I agree with Col Chopra that like many other preparations on the market the potency of the tinct digitalis is somewhat destroyed by the hot climate of Bengal, in the light of the results obtained from these investigations into the conditions of the myocardium recorded above I submit that it is very probable that if digitalis fails to act in this climate it is not so much on account of its being destroyed by the tropical sun nor because it is not absorbed from the alimentary canal, but because the tropical heart being normally undeveloped and degenerated, owing partly to malnutrition and partly to the combined ravages of specific and focal infections possesses very few healthy fibres to respond promptly to digitalis. This I believe to be the true explanation of the feeble response to digitalis in hospital practice

Before I conclude this paper I should be failing in my duty if I did not sufficiently acknowledge my deep sense of indebtedness and gratitude to Col Hugh Acton I M S, for the kind help he has rendered me in examining my slides to Major J C Dey, I M S, Police Surgeon, Calcutta, for kindly allowing me to collect the hearts from his post mortem examinations to Major J A Shorten, I M S for kindly orthodiagraphing my cases to Col F A F Barnardo, I M S, for kindly allowing me to have electro cardiograms for my cases, to the Librarian, Royal Society of Medicine London, for kindly supplying me with the statistics from the different

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REFERENCES.

Basu, U. P. (1924) .. .. The rôle of adventitious sounds in the diagnosis of diseases of the chest. *Indian Medical Record*, August.

Idem (1925) .. .. .. Preliminary observations on acquired diseases of the heart and aorta as met with in Bengal. *Ind. Med Gaz.*, July.

Idem (1926) .. .. .. Epidemic dropsy conference at the Calcutta Medical Club. *Cal. Med. Jour.*, October.

Chopra, R. N., Bose, S. C. and De, P. (1925). Variations in the potency of digitalis preparations in the tropics. *Ind. Med. Gaz.*, March.

Rogers, Sir Leonard (1925) .. *Pathological evidence bearing on disease incidence in* Calcutta. *Glasgow Med. Jour.*, January.

University of Calcutta Publication (1926). Report on the students' welfare scheme (Health Examination Section).

DISCUSSION.

Major H. Stott, I.M.S. (United Provinces) : We hope Dr. Basu will continue his clinical, pathological and histological investigations on the heart in Bengal. When first he published some of his work in this direction in 1925 he promised to continue this work and to-day he has in part kept his promise. But we hope still in the future this work will go on and, with the open mind of a clinical research scholar, he will continue to investigate and publish his results. One point brought out by Sir Leonard Rogers was that there was no rheumatic fever in Calcutta and that this cause of valvular disease could be ruled out. Further investigation is required as to the organism or process responsible for the valvular and myocardial defects found at post-mortem.

Lieut.-Col. F. A. F. Barnardo, I.M.S. (Bengal) : While encouraging the speaker in this research he did not altogether agree with many of the results. The presence of the numerous secondary infections (viz., 80 per cent of hookworm, 75 per cent of malaria and 50 per cent of worms) would explain the condition of the heart in Bengal.

The 'hanging heart' of the orthodiagram probably resembles the 'hanging heart' of tuberculosis which is due to the loss of elasticity of the lung tissue and very difficult to eliminate, rather than the miserable heart which the speaker had called attention to. Then as to the use of digitalis, it was only suitable in cases when the sino-auricular node was losing control and required help, and its value did not depend on the condition of the cardiac muscle itself. The advantage of small doses of digitalis was often seen and was markedly beneficial in cases of capillary difficulty by maintaining the elasticity of the smaller vessels and thus helping the capillary circulation.

Dr. Bhagwat Sahai (Gwalior, B. India) : While listening to this paper one is struck with the statement that an apparently normal Bengalee heart shows degenerative changes. Degenerative changes are pathological improbabilities unless there is a suitable chronic infective process at work. One can understand an under-development without disease, but definite pathological findings must rest on some disease process.

Dr. Basu has struck a very valuable note in emphasizing the importance of the myocardium, it is by far the greatest factor in the prognosis and therapeutics of cardiology.

I agree with Dr Basu, and I am sure many will concur, that the tincture of digitalis is as good as any other preparation on the market, provided of course the indications for digitalis therapy are correctly made out

Again, the use of digitalis in acute infective fevers is a matter of controversy If one decides to use digitalis, in my opinion, it should be given early and its effect watched not by slowing of the pulse, but by the improvement of the first sound at the apex

Dr Ram Behari Tandan (Jodhpur, B India) gave the following example of the bad effects of digitalis

Rajput, Hindu, aged 53, widower from 1 year, given mercury by mouth to severe salivation about 6 months ago by a Vaid for some venereal complaint No symptoms of syphilis at present Œdema of abdomen, legs, arms and hands Scanty urine very frequently Visited in April 1927 Complaining of very severe pain in right hand up to the finger and in the shoulder blade Very severe and constant hiccough they came on even during sleep Two years before got pain in cardiac area and was treated by oral administration and hypodermic tablets of trinitrin by another physician Patient gave history of cardiac uneasiness during several years before that time Has been very fond of daily sports in his early youth Pulse 120 respiration 40 Analgesics and hypnotics did no good Purgative and steam bath for about 10 minutes up to 104° F, did much good Urine drawn by catheter for 3 days after which he passed it voluntarily Tinct digitalis began in 5 minim doses three times a day increased up to 10 minims per dose with anasarcin tablets given for 10 days All symptoms disappeared but the pulse never came down below 100 and the respiration not below 38 On the tenth day the old stock of digitalis being finished a new bottle was opened and the next morning I found his pulse irregular in force and rhythm and intermittent after 10 to 30 beats with great uneasiness in the cardiac area and also in the back Digitalis and anasarcin all stopped The belladonna, chlorodyne and belladonna plaster removed the complaint in 2 or 3 days Patient gradually left his bed In August he again got sleeplessness, slight general œdema, scanty urine and other heart symptoms This time he was treated by another doctor with two anasarcin tablets 3 times a day After some days' treatment I saw the patient and found intermittent pulse The anasarcin was stopped and the pulse became all right soon

Dr U P Basu (Bengal) replied I am grateful to those who have joined in the discussion Col Barnardo has said that the toneless flask shaped hearts whose orthodiagrams I have shown, are due to the presence of primary disease in the men and some other speakers have agreed with him I am afraid Col Barnardo and those who followed him must have been absent at the beginning of my paper as I mentioned that I selected from orthodiagraphy only those cases which were absolutely normal How, therefore, could the question of disease crop up in these cases ?

I am afraid I cannot agree with Col Barnardo that digitalis does not act upon the heart muscle but through the vagus All authorities nowadays believe that digitalis has got a direct action upon Gaskel's bridge apart from its effect upon the vagus nerve I do not know how he can dispute the action of digitalis directly upon the heart

PRESENT DAY TREATMENT OF CHOLERA.

BY

LAL BEHARY GANGULY, M.B.,

Teacher of Medical Jurisprudence, Campbell Medical School and Hospital, Calcutta.

ABOUT 1,000 cases of cholera are treated annually at the Campbell Hospital, Calcutta. These all come from the poorer classes, ill nourished and ill fed, often anæmic and cachectic, steeped in an insanitary environment. They come at all stages of the disease, often 12 to 24 hours after the onset of the disease and almost all of them pulseless and in a state of profound collapse. Even amongst such a desperate lot of cases we can easily get a recovery rate of fully 80 per cent.

The treatment is mainly symptomatic, and, in a nutshell, it is a matter of keeping the patient alive by the judicious administration of saline transfusions, until the patient's own system is able to overcome the toxæmia and reassert itself. Our treatment is principally based on the appreciation of one great factor, viz., the *collapse of cholera* may be due to 3 causes: (*i*) enormous loss of fluid from the blood and tissues and a consequent rise in the specific gravity of the blood, without any inherent weakness of the heart being present, (*ii*) weakness of the heart itself without much loss of fluid, (*iii*) a mixture of (*i*) and (*ii*). This appreciation is the keystone to the treatment of cholera, inasmuch as, when the collapse is mostly due to loss of fluid, restoration of the fluid, lost by intravenous saline transfusions brings back life to the patient; but when cardiac weakness is the chief factor at work, intravenous transfusions by overloading the already weak heart surely bring on a disastrous result within a few hours.

Collapse has, therefore, got to be treated by saline transfusions according to the degree of concentration of the blood, or, in other words, according to the specific gravity of the blood. If the specific gravity is high, 1064 or so, transfusions are given intravenously; but if, in the presence of collapse, the specific gravity is moderate, intravenous transfusions are given with the greatest circumspection and in small amounts. When the specific gravity is raised only a little above normal, the small amount of fluid required is given by the subcutaneous route; absorption then is slow and the heart is spared. It is a common experience to find that cases with a low specific gravity, treated in this way, carry on with a feeble or scarcely perceptible pulse for days and ultimately come round quite well. The story of the treatment of cholera is mainly one of repeated collapses which

are overcome with repeated saline transfusions, given according to the specific gravity indications of the blood, until a time comes when there is no longer any recurrence of serious collapse and a reasonable pulse is maintained at the wrist It has to be borne in mind that as the case progresses from day to day the chances of any given collapse being due more to cardiac weakness than to actual loss of fluid increase so that when salines have to be repeated the necessity of regulating them by means of the specific gravity of the blood increases the life of the patient depends on these transfusions and I should consider an intravenous transfusion given without any reference to the specific gravity of the blood as criminal, as it is easy to drown a cholera case with uncalled for intravenous transfusions

The *quantity of fluid* to be transfused naturally depends on the amount lost We never have any occasion to exceed 4 pints at one sitting and usually the required quantity is somewhere near 3 pints with the specific gravity of the blood at about 1062 Larger amounts have been advocated in some quarters but no risks should be taken about overloading the heart and rather than give at one sitting as much as the cardio vascular system can be made to hold, it is much safer to give moderate amounts and repeat if necessary

The composition of the saline — In early cases our first transfusion is of the hypertonic variety and the successive ones normal, with more or less bicarbonate of soda added to prevent acidosis and consequent uræmia the general principle followed being gradually to decrease the salinity and increase the alkalinity of the transfused fluid as the case progresses If urination after the first transfusion is free no soda is added to the succeeding one or two normal saline transfusions, but if the urine is not inclined to be free and if for other reasons we apprehend difficulty, we start soda early In cases of threatened uræmia, we use a soda solution as strong as 160 grs of the bicarbonate with 60 grs of sodium chloride to the pint in desperate cases we give a 1 per cent solution of the bicarbonate only 10 to 15 ozs at a time, with not infrequently dramatic results The degree of acidosis in cholera is astonishing—patients after receiving these all aline transfusions for three or four days on end still pass urine acid in reaction If at any time there is any doubt as to whether the patient will tolerate further amounts of alkali, the test of the reaction of a drop of urine with litmus paper will at once furnish a reliable answer

By the free and timely use of alkalies *uræmia* has practically been stamped out as a cause of death in cholera Threatened uræmia we recognize chiefly by the character of the breathing —an index as delicate and infallible as a barometer The respirations get deeper and quicker, their depth being the significant point, deep respirations with a slight hissing sound, apathy with restlessness and irritability at once tell us that uræmia is threatening, and this irrespective of the amount of urine that the patient may be reported to have passed It is only when the patient is on the threshold of uræmia that anything can be done for him, once uræmia has set in practically nothing is of any avail Another noticeable feature of cholera uræmia is the fact that in fully 65 per cent of cases the pulse is not full and bounding with a high pressure, but is decidedly feeble

It is very necessary to raise a word of warning about intravenous transfusions. In about 60 per cent of cholera cases, the *internal temperature* of patients in the collapse stage is raised, and, in some cases, especially amongst Europeans, it is fairly high. After an intravenous transfusion there is a rigor followed by a reactionary fever of several degrees, and, if the internal temperature is already high, hyperpyrexia follows, speedily ending in death. I have seen numerous deaths from this cause only, the medical attendants wondering at the apparently unaccountable disastrous issue and, finally, the whole blame being laid at the door of the saline transfusions and allopathic treatment of cholera generally. A thermometer in the rectum would have at once solved the problem. The rectal temperature should be invariably taken before a drop of saline is put into the veins. If it is already high, attempts should be made to reduce it by iced saline enemata and by the injection of the required amount of saline, not at blood heat, but at ordinary room temperature. After transfusion, the rectal temperature should be taken every now and then for an hour at least. If the temperature is high and cannot be reduced soon enough, then, rather than face certain death from hyperpyrexia by an intravenous transfusion, we put the fluid in subcutaneously, thus gaining time, and meanwhile keeping on attempting reduction. The intravenous injection can then be given when the temperature has been brought down to near normal at least. Finally, we have to see that the thermometer is accurate ; I have known a millionaire's only son die of hyperpyrexia which had lasted for 48 hours just because the family thermometer read 2° less than the actual temperature.

It has frequently been observed that in cases tending to uræmia, although urination is scanty yet the *bowels* get gradually locked up, three or four scanty greenish stools a day, with the dreaded symptoms coming on. In such a condition reopening of the bowels, by eliminating toxins, not infrequently acts as a veritable charm: castor oil in ounce doses, repeated if necessary, is very suitable for the purpose. There need be no hesitation in using the oil ; the fear is not that the oil will produce excessive purgation and consequent collapse, but that the oil will fail to act. Even if it does cause a recurrence of the collapse by depleting fluid, the amount lost can easily be restored any time, and as often as desired, by salines, while the coincident elimination of toxins is simply invaluable and unattainable in any other way.

Another dreaded complication and bar to the free use of intravenous transfusions is the presence or onset of *lung trouble.* In some cases, from the very start a careful examination of the lungs will reveal the presence of patches of vague rales or rhonchi. or areas of deficient resonance and air entry ; in others, these develop after the patient has received some transfusions. When these are present, intravenous transfusions, not infrequently, only serve to precipitate an attack of pneumonia. If there is collapse and the specific gravity of the blood is high, the risk has to be taken and minimal amounts of saline given intravenously. If, however, it can possibly be managed, the saline should preferably be given subcutaneously and the risk of pneumonia or œdema of the lungs avoided.

No specific treatment of cholera by *drugs* has been found so far Vario drugs have been advocated and tried from time to time with practically no resul Whatever drug is employed, it must fulfil one great desideratum, viz. it must n irritate the kidneys in any way whatever Judged by this criterion practicall everything in the shape of a gastro intestinal disinfectant must at once be excluded These have, undoubtedly been employed and the cases so treated have not al perished mainly due to the fact that absorption from the gastro intestinal tract in cholera is practically nil a beneficient nature having provided this very necessary protective safety valve action

Potassium permanganate in the shape of coated pills was introduced by Col Sir Leonard Rogers Our indebtedness to him is great for having put the treat-ment of cholera on a rational basis but these armoured pills very often pass out as undissolved pellets and if a dose massive enough to be effective is given the treat ment itself becomes a disease in the shape of abdominal pain discomfort and tenesmus and the recovery rate is no better than with any other conceivable innocuous substance that can be employed

Kaolin has been boosted the idea being literally to produce a clay in the intes tines Advocates claim that even saline transfusions are unnecessary in cases put on kaolin Our experience has been that patients cannot be persuaded to swallow the enormous quantities necessary When the drug has been pushed it has simply been vomited the appearance of bile in the stools has been delayed, and far from salines being unnecessary repetitions were required more frequently and the incidence of uræmic symptoms more marked The drug provoked tympa nites, and in one case there was practically intestinal obstruction But kaolin acts like a charm where the stools are bloody and causes the blood to disappear very soon indeed

Judged by the criterion laid down above the *essential oils mixture* would be put out of court at once It has, however been tried but has only been followed by a burning sensation in the throat and stomach increased vomiting often blackish stools general discomfort and restlessness together with increased tendency to uræmic symptoms

We are in the habit of putting our patients on fractional doses of *calomel* until the stools begin to change colour The powder is easily taken, has a tendency to allay vomiting the stools become bilious soon enough and the recovery rate is somewhat higher than with any other drug At any rate, calomel so employed has the great merit of being absolutely harmless and, even if only that much is onceded for it its use would be justified or at least not objected to

For the treatment of serious cardio vascular depression both *pituitrin* and *drenalin* have been extensively used Where a fair pulse has been establish means of saline transfusions the use of these may cause some further impro nt, but when salines have failed to restore the pulse, both are equally us nomentary flicker of the pulse is the only result If either of the two has be d I think pituitrin should have the preference because it does not constr t the

kidney vessels along with the others, as adrenalin does, and thus in a given time a larger amount of blood should circulate through the kidneys and increase the urinary solids.

We have found that for combating really grave cardiac depression, only two drugs hold the field, viz., *atropine* and *caffeine*. Atropine must not be overdone for fear of provoking intestinal paresis. In severe cases of cholera with paralysis of the intestines and consequent tympanites and scanty purging, pituitrin combined with *eserine* is usefully employed.

The treatment outlined above is purely symptomatic; but if salines are given under proper safeguards and no drug that can irritate the kidneys is used, 80 to 85 per cent of recoveries can easily be obtained even in pulseless cases. A certain percentage of deaths will inevitably occur amongst those who come under treatment late and in whom the intoxication is so intense that the collapse simply cannot be overcome; or where the kidneys are irretrievably damaged. Luckily such cases are few, only 10 to 15 per cent, a figure very low indeed for a terrible scourge like cholera.

THE INCIDENCE AND SIGNIFICANCE OF CERTAIN CLINICAL SIGNS IN CHOLERA.

BY

J WALKER TOMB, O B E , M A , M D , D P H ,

Medical Officer of Health, Asansol Mines Board of Health

This paper deals with 1,185 cases of cholera in the Asansol Mining Settlement in which the incidence of intestinal cramps and abdominal pain bloody stools, and vomiting preceding diarrhœa in this condition is analysed and their prognostic value estimated So far as the writer is aware no previous analysis of this kind has been published

From the subjoined table it will be seen that the percentage of cases in which intestinal cramps and abdominal pain were present was approximately 30 per cent The percentage of cases in which vomiting preceded diarrhœa was 3 5 per cent and the percentage of cases in which blood occurred in the stools was 2 5 per cent As regards prognostic significance the death rate amongst cases having intestinal cramps and abdominal pain was 63 per cent compared with a death rate of 52 8 per cent amongst those not having intestinal cramps and pain The mortality rate amongst cases with bloody stools was 20 per cent compared with a mortality rate of 57 per cent amongst those not having bloody stools From the table it will also be seen that the average mortality rate of the whole series of 1,185 cases was 55 8 per cent, the mortality rate in cases receiving treatment of any kind being 51 0 per cent compared with a mortality rate of 91 5 per cent in those receiving no treatment The annual mortality rate of untreated cases of cholera in the Asansol Mining Settlement, it may be here remarked is constantly over 90 per cent

A careful search of the literature on food poisoning has failed to reveal the sequence of diarrhœa and vomiting in that disease I would suggest that investigations into this point may profitably be made by members of this Congress who are in a position to do so both as regards food poi oning and irritant poisonin the two affections most closely resembling cholera in their clinical manifestatio and the results published for general information Should it be found th in food and irritant poisoning the sequence of diarrhœa and vomiting differ rom that in cholera a valuable aid in the differential diagnosis of these very milar conditions in non epidemic areas will have been provided

It would appear, however, that whereas in cholera only 30 per cent of cases suffer from intestinal cramps and abdominal pain, in food poisoning intestinal cramps and abdominal pain are constantly present. W. G. Savage in his report to the Medical Research Council on 100 outbreaks of food poisoning, published in 1925, and in his Malcolm Morris Memorial Lecture 1927(1) says :—'The three cardinal symptoms present with great constancy in typical food poisoning outbreaks are acute vomiting, diarrhœa and acute abdominal pain. Occasionally, vomiting was infrequent or absent. On the other hand, in many outbreaks due to toxins alone, the vomiting was very severe and persistent.'

Summary.

1. In 70 per cent of cases of cholera, intestinal cramps and abdominal pain are absent. When present, they are of somewhat unfavourable prognostic import.

2. Diarrhœa precedes vomiting in cholera in 96 per cent of cases.

3. Bloody stools occur in cholera in less than 3 per cent of cases. They are of very favourable prognostic import.

REFERENCE.

(1) Savage, W. G. (1927) .. .. *Lancet*, October 22nd, p. 900.

Table I.

Total number of cases analysed.	Total number of deaths.	Total mortality rate per cent.	Treated.			Untreated.		
			Cases.	Deaths.	Mortality rate per cent.	Cases.	Deaths.	Mortality rate per cent.
1,185	661	55·8	1,056	539	51·0	129	122	94·6

Table II.

Total number of cases.	Number of cases in which intestinal cramps and abdominal pain were present.	Percentage of cases in which intestinal cramps and abdominal pain were present.	Mortality rate per cent amongst cases in which intestinal cramps and abdominal pain were present.	Number of cases in which intestinal cramps and abdominal pain were absent.	Mortality rate per cent amongst cases in which intestinal cramps and abdominal pain were absent.	Number of cases in which vomiting occurred first.	Percentage of cases in which vomiting occurred first.	Number of cases with blood-stained stools.	Percentage of cases with blood-stained stools.	Mortality rate per cent amongst cases with blood-stained stools.	Mortality rate per cent amongst cases without blood-stained stools.
1,185	338	28·5	63·3	847	52·8	42	3·5	30	2·5	20·0	57·0

DISCUSSION

Dr A R Majumdar (Bengal) *Specific Gravity*—One cannot decide either the quantity or the time for giving intravenous saline injections by the specific gravity factor alone When I was in charge of stations in North Bengal where half the population had got enlarged spleens, I came across cases where patients showed unmistakable signs of gross loss of fluid yet the specific gravity was about 1031 with no pulse at the wrist In some of these cases, I had to give as much as 5 pints of saline When these cases became convalescent, I found that their specific gravity was about 1012 and their red cell count was 1 to 2 millions

If, therefore, one had to decide on the indication for intravenous saline on the specific gravity basis alone, none of these unfortunate people would have got the benefit of this advanced method of treatment I think that all factors, specific gravity, blood pressure and the general clinical condition, should be taken into consideration

Dangers of subcutaneous saline—In badly collapsed cases, saline given subcutaneously does more harm than good One can only give 1 to 2 pints subcutaneously If therefore, the patient has lost as much as 5 to 6 pints of fluid, 1 to 2 pints will only raise the blood pressure slightly, not enough to make the kidneys act but may be sufficient to establish a circulation favouring absorption of the toxin, thus favouring the onset of uræmia In fact, some of the milder cases of cholera which do not cause sufficient anxiety in the mind of the patient or the doctor, because of the slight degree of collapse present, die of uræmia for this reason

Hyperpyrexia is an important factor Great care should, therefore, be taken in all cases immediately after an intravenous injection to guard against such an eventuality If with hyperpyrexia there is also loss of consciousness such cases never recover In some cases there is also a rise of temperature the next day The cause of this is uncertain but even this late rise may be hyperpyrexial and fatal

Pneumonia Some of these cases of pneumonia are due to the 'comma' bacillus itself Such cases are very fatal Anti cholera serum of sufficient potency is the only remedy

Permanganate pills—The pills on the market are unsuitable on account of their size and hardness If these are made fresh with kaolin and vaseline and given a fresh coating with kaolin (as described by me in *Indian Medical Gazette* some years ago), they are not vomited and are dissolved more rapidly So much so, that the form of the stool changes in 3 to 6 hours' time

Dr Bhagwandas J Devidasani (Sind, B India) Dr Ganguli will admit that general practitioners are the chief people who have to face epidemics I would request Dr Ganguli to suggest the easiest method of taking the specific gravity of the blood before giving saline intravenously in such cases The method should be rapidly and easily done, especially for epidemics in the field

Dr J W Tomb (Bihar and Orissa) Congratulated Dr Ganguly on his elaboration of the technique of intravenous saline injections in the treatment of collapse in cholera, and on his most excellent results Cholera, however, is clinically divided into two stages (1) the stage of evacuation, and (2) the stage of collapse from loss of fluid Saline injections were a treatment for collapse It was as irrational to advocate the

use of such injections as a treatment for the stage of evacuation as it would be to advocate the administration of a preparation of iron per os for the treatment of collapse due to hæmorrhage. The treatment of the two stages was quite distinct. Experience in the Balkan War, the Great War, in India and elsewhere had amply proved that medicinal remedies such as kaolin, morphia, and the essential oils mixture were of the greatest value in the primary stage of the disease. With regard to the essential oils mixture which Dr. Ganguly had condemned so whole-heartedly, he had to say that universal experience in public health work in India and in China did not support his adverse views. The great value of the essential oils mixture was that it was harmless, could be administered by any intelligent person and that one person could treat hundreds of cases if necessary at one time. It was a powerful astringent, carminative and stimulant. Relapse after its use was unknown. If used in the early stages of the disease, it stopped diarrhœa and vomiting forthwith and thus prevented collapse with its fatal uræmia. Collapse was the direct cause of the so-called post-choleraic uræmia as no patient ever died from uræmia in cholera in whom collapse had not first occurred.

Dr. S. C. Basu (Bihar and Orissa) : The treatment of cholera would be much improved if fresh serum from convalescent patients was injected into patients. In this way, I think, the mortality would be much lowered. We found that with a specific gravity of the blood of 1064, or below, there were no deaths ; with a specific gravity of 1066, the mortality was about 35 per cent ; with a specific gravity of 1068, the mortality was about 44 per cent (*vide* Drs. Das and Basu's paper on convalescent cholera serum read at the Indian Science Congress in 1927 at Lahore). Generally 2 to 3 c.cs. of serum are injected. As regards the condition of the lungs, passive congestion is generally found. Amongst nine patients in whom a post-mortem examination could be held, abscess of the lungs was found in two cases, infarcts in three cases and passive congestion in six cases.

Dr. A. C. Ukil (Bengal) : Said he took the hint of using cholera convalescent serum from the late Dr. P. Das of Puri a year ago and had collected over 50 sera of convalescents. These sera had been tested in the laboratory by the speaker for their protective and curative properties on rabbits. The results were embodied in one of his papers meant for this Congress. He found that 0·5 to 0·1 c.c. of serum from cholera convalescents, according to different samples, protected rabbits against a lethal dose of 11,000 millions of vibrios given intravenously. He was also using these sera in his wards and the German serum recently prepared by Professor Hahn. From the small number of cases treated (about 50) he was not in a position to pass any definite opinion as yet, but judging from laboratory results he thought that 2·3 c.cs. of convalescent serum could not be expected to produce miracles in the treatment of cholera.

Dr. L. Ganguly (Bengal) replied : His observations dealing with the specific gravity of the blood referred to the average case only and not to special cases suffering from extreme anæmia. Specific gravity bottles were obtainable from any chemist of repute. In reply to Dr. Tomb he said that he was of opinion that the stopping of the bowels in cholera, even in its preliminary stages, was contrary to all accepted principles of treatment of cases with intestinal flux.

EPIDEMIOLOGY OF INFANTILE BILIARY CIRRHOSIS OF THE LIVER

BY

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Editor, 'Indian Medical Record,' Calcutta

THE present enquiry is of a preliminary nature and intended to clear the ground for future work The enquiry has taken the form of an investigation into the following points —

(1) Geographical distribution of the disease,
(2) Topography of the districts where the disease is present,
(3) Influence of climatic conditions
(4) Distribution according to race
(5) Distribution among Hindus Mohammedans and Christians,
(6) Distribution according to caste and social conditions,
(7) Distribution according to sex
(8) Distribution according to age,
(9) Influence of diet,
(10) Infectiousness

(1) *Geographical Distribution of the Disease.*

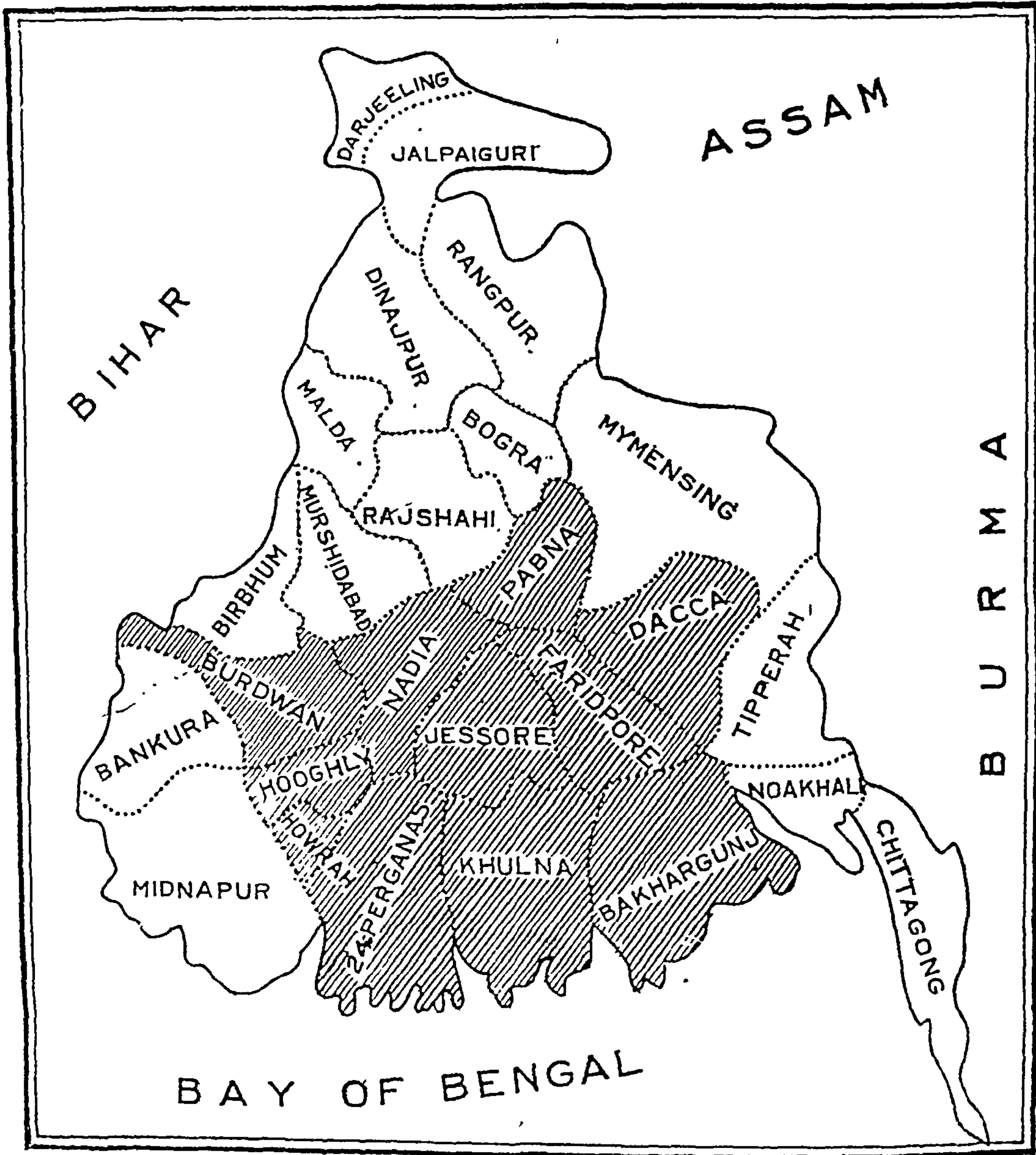
Infantile Biliary Cirrhosis is a peculiar disease of infants seen only in India The two principal foci of the disease are Bengal and Madras

In *Bengal* the disease is seen mostly in Calcutta and the towns of the neighbouring districts (*vide* Map I)

The Calcutta municipality keeps a record of deaths from this disease (*vide* Chart 1) but unfortunately no such records are available in the case of other municipalities or district boards in Bengal The returns of hospitals and charitable dispensaries do not provide any information with regard to the relative incidence of this disease in different areas, as in these returns all diseases of the liver are grouped under one heading In this way much valuable material is being lost

The difficulty in investigation is increased by the fact that there is no children's hospital worth the name in Bengal. Children are rarely taken to general hospitals

MAP I.



Map of Bengal showing distribution of Infantile Biliary Cirrhosis.

and are mostly treated at home by private practitioners who never keep any record of cases.

STATISTIQUES OBSTÉTRICALES

(HOPITAL DE LANESSAN HANOI)

PAR

E JOURDRAN,

Médecin chef de l'Hôpital de Lanessan Directeur Local de la Santé Publique au Tonkin

Naissances de nuit et de jour

	Jour						Nuit				
	1923	1924	1925	1926			1923	1924	1925	1926	
6h à 9 h	15	9	22	30	76	18 h à 21 h	17	16	7	10	66
9—à 12—	8	14	14	34	70	21—à 0—	11	14	14	18	57
12—à 15—	14	17	24	12	67	0—à 3—	18	18	19	25	60
15—à 18—	18	13	12	17	60	3—à 6—	17	15	18	25	75
	55	53	72	93	273		63	63	58	81	268
	273						268				

Si l'on compare séparément les naissances survenues de jour et de nuit pendant les années 1923, 1924, on constate que les accouchements sont plus nombreux la nuit que le jour

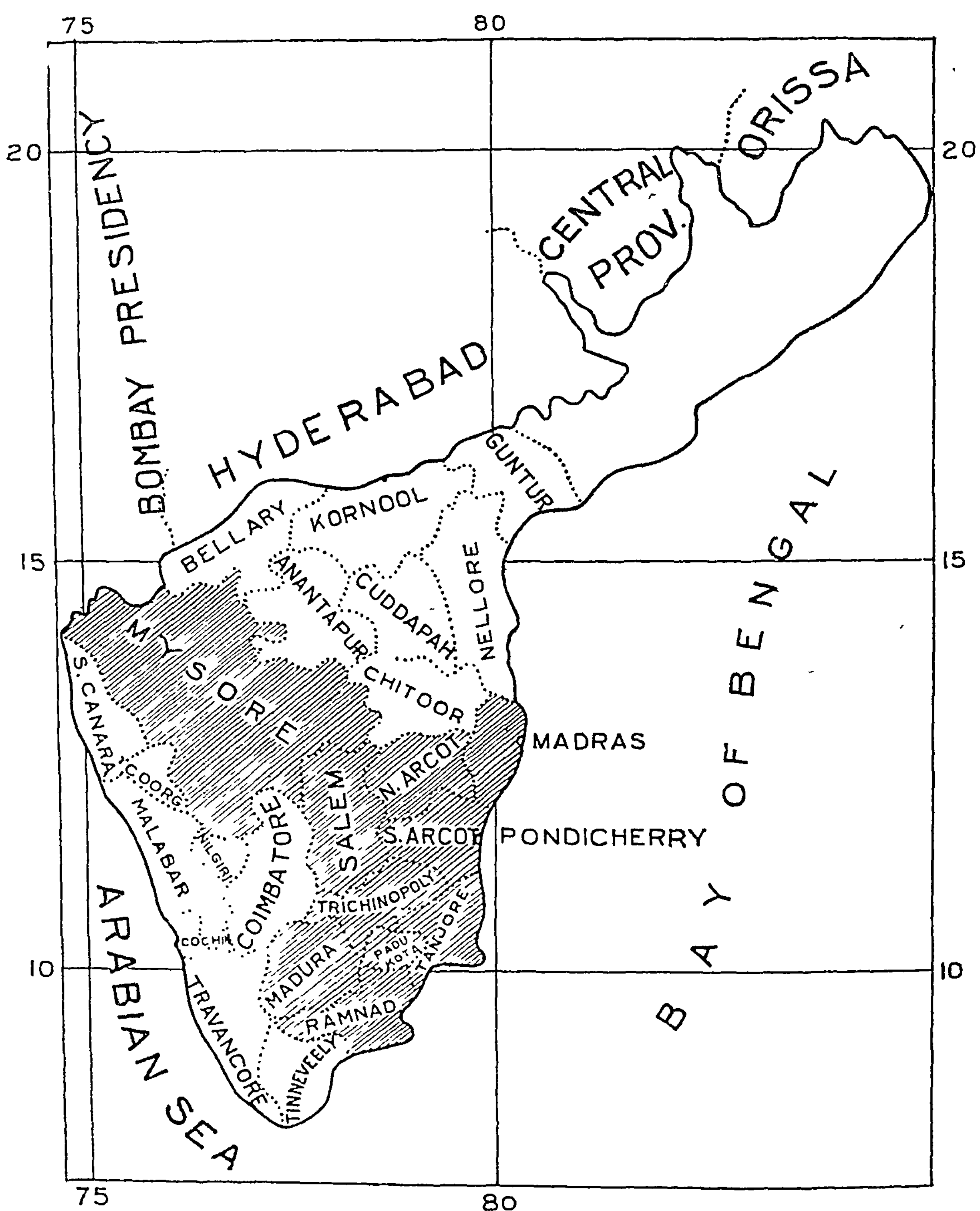
En 1925, 1926, c'est pendant le jour que les naissances s'observent

Pendant le jour, les naissances se font plus nombreuses le matin entre 6 h à midi que le soir

Pendant la nuit, c'est entre minuit à 6 h du matin que les enfants naissent

In *Madras* cases have been reported from Madras town, Arcot, Salem, 'richinopoly, Madura, Ramnad, Tanjore, Padukota and Mysore (*vide* Map II).

MAP II.



Map of the Madras Presidency showing distribution of Infantile Biliary Cirrhosis.

Reports of cases have been published from time to time by private practitioners of Madras, but unfortunately the hospitals and municipalities of the Madras Presidency also have no arrangement for recording the statistics of these cases.

During the period 1921—1927 inclusive (seven years), the author has seen 374 cases, of which 292 were Bengalees. An analysis of this figure (292), may be

CHART 1.



Total Deaths from Infantile Biliary Cirrhosis of the Liver in Calcutta
(From Statistics of Health Officer of Calcutta Corporation)

taken as representing in some manner the prevalence of this disease in the various districts of Bengal:—

Name of District			*Number of Cases.*
Calcutta	..	..	187
24-Perganas	..	..	66
Howrah	..	..	18
Hooghly	..	..	6
Burdwan	..	..	3
Bakhargunj	..	..	3
Dacca	..	..	3
Nadia	..	..	2
Khulna	..	..	1
Jessore	..	..	1
Pabna	..	..	1
Faridpore	..	..	1

until at last it merges in the uplands of Chota Nagpur. The number of cases of infantile biliary cirrhosis gradually decreases in the western part of the province where the soil becomes more hilly.

In the *Madras* Presidency also the disease is found only in the plains. This province is traversed by two ranges of mountains, the Eastern Ghats and the Western Ghats running more or less parallel to the respective coasts. The Western Ghats reach a height of 3,000 to 8,000 feet and stretch through the districts of S. Canara, Malabar, Nilgiris and the states of Travancore and Cochin towards the tip of the Peninsula. The Eastern Ghats are a less marked formation usually about 2,000 feet in height and stretch down the eastern coast but at greater distance from the sea. Infantile biliary cirrhosis is not seen in these hilly parts of Madras Presidency.

(3) *Influence of Climatic Conditions.*

Temperature and Humidity. - The disease is seen most in Bengal and Madras. Madras is situated in the tropics; while though almost outside the tropical zone, the climate of Bengal is for about two-thirds of the year, i.e., from the middle of March to the end of October, of the kind characterized as tropical. During these months Bengal has a high temperature and humidity and a dry and wet season. During the other months, however, the temperature is much lower, the humidity is slight or moderate and the rainfall is generally scanty.

In Madras there are practically two types of climates—wet and dry. The dry season occurs from December to May and the wet from June to December. In the latter part of the dry season, very high rises of temperature are common. In the hilly regions, where there is no infantile biliary cirrhosis, the temperature is much lower even in the dry season.

Seasonal Incidence.—As the onset of infantile biliary cirrhosis is very insidious and slow, the attention of the parents is generally drawn to the condition when the disease is already in a somewhat advanced stage. It is, therefore, rarely possible to ascertain correctly when the disease actually started. So, it is difficult to find out whether there is any particular seasonal incidence for the disease.

(4) *Distribution according to Race.*

In *Bengal*, all the cases seen by us occurred in Bengalee families—both Hindu and Mohammedan. We did not see any case among Beharis, Uriyas, Punjabis, Jews, Europeans, etc., living in Bengal.

In *Madras*, the people are not so homogeneous as in Bengal. The districts, northward from the city of Madras, are populated by a people speaking the Telegu language: and the portion from the city of Madras southward to the tip of the Peninsula is populated by the Tamils. Malayalees live in the Malabar districts and Travancore State: and the Canarese speaking people in Bellary and Anantapur districts. Infantile biliary cirrhosis is very rarely seen among the Telegus. It is common among the Tamil children. An analysis of the 82 Madrasee patients,

The writer has seen only 82 cases among Madrasee children during the same seven years. This small number is due to the distance of Madras Presidency from Calcutta where the writer lives. The writer has received much valuable help from some private practitioners of Madras who have not only co-operated with him by sending him cases but also during his investigation in Madras. An analysis of these 82 cases may be interesting though not sufficient to come to any conclusion as to the relative incidence of the disease in the districts of the Presidency

Name of District	*Number of Cases*
Madras town	60
Trichinopoly	4
Arcot	3
Salem	3
Vizagapatam	2
Ramnad	1
Coimbatore ..	1
Madura ..	1
Mysore State ..	7

It is necessary to collect more accurate information regarding the incidence of infantile biliary cirrhosis in the Madras Presidency. Such an enquiry would require much time, money and the co-operation of the hospital authorities and medical practitioners. The present enquiry was carried out by the writer without any outside help and was greatly handicapped for want of funds necessary for investigation in the Madras Presidency on a larger scale

It is significant that no case has been reported from Assam, the hotbed of kala azar

In Bengal kala azar is present in some of the districts where cases of infantile biliary cirrhosis are also found. But infantile biliary cirrhosis is seen more in the towns while cases of kala azar may occur in towns or villages. Moreover kala azar very rarely attacks infants and infantile kala azar is not seen in this country. To eliminate any mistake in diagnosis a routine examination of the blood was made in all cases for differential count and aldehyde reaction

Cases of infantile biliary cirrhosis have also been rarely reported from Bombay and some parts of the United Provinces

(2) *Topography of the Districts where the Disease is Present*

Infantile biliary cirrhosis is not present in any place at a higher level than 1,000 feet above sea level

In *Bengal* where the disease is prevalent, the soil is low and alluvial. Central and Eastern Bengal are delta lands. The part west of the Ganges lies outside the true delta. The eastern portion of this tract is low and of alluvian formation, but further west laterite begins to predominate and the surface rises more and more

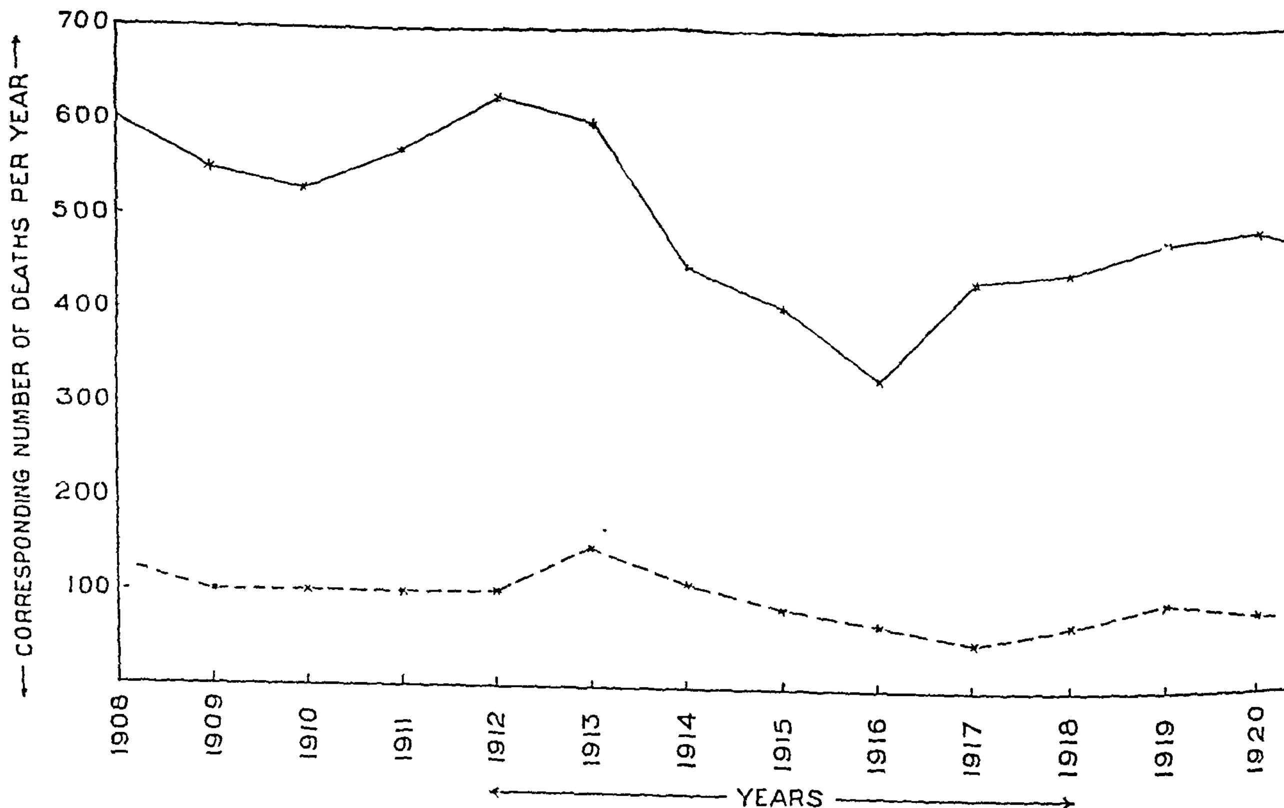
Thus, the high incidence amongst the Hindu children is not in relative p portion to the relative population of the Hindus and the Mohammedans.

In Calcutta, however, there is a preponderance of Hindus over Mohammed Here we find that out of 187 cases seen by the writer, 153 were Hindus, 33 v Mohammedans and one was a Christian. The relative incidence of the dis in the different classes of the population in Calcutta is shown by the follov average annual death rates from infantile biliary cirrhosis in Calcutta.

Hindus	448
Mohammedans	86
Christians	3
Anglo-Indians	2
Other classes	1

Thus the statistics of death from the disease in Calcutta also show relati a greater mortality amongst Hindu children (*vide* Chart 3), the relative p portion of the Hindu and Mohammedan population in the city being about 3 :

CHART 3.

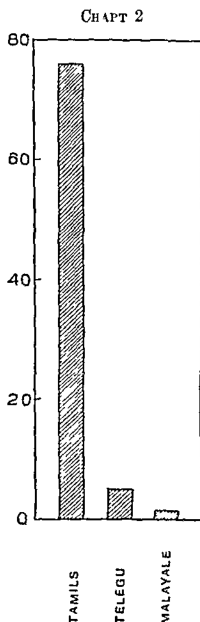


Deaths from Infantile Biliary Cirrhosis of the Liver in Calcutta according to classes.
Hindus ————————
Mohammedans - - - - - - - -

In the *Madras* Presidency, 89 per cent of the people are Hindus and onl per cent Mohammedans. All the 82 cases seen by the writer among Madra children were Hindus.

seen by the writer, shows that there were 76 Tamils, 5 Telegus and only one Malayalee among them (*vide* Chart 2)

CHART 2



Cases seen by the author among the Madrasees according to races (Statistics of 7 years)

(5) Distribution among Hindus, Mohammedans and Christians

In Bengal the percentage of Mohammedans is slightly higher than that of the Hindus But in the series of cases seen by the writer the percentage of the disease among the Hindus is found to be higher than among the Mohammedans It is rare among the Christians and Anglo Indians Out of 292 Bengalee patients 210 were Hindus 51 Mohammedans and only one Christian

240 cases among Bengalee Hindu children seen by the writer 130 were Brahmins, 102 Kayasthas and Vaidyas and only 8 belonged to well-to-do low caste families (*vide* Chart 4).

In *Madras* also the disease is seen more in Brahmin families. Out of 82 Madrasee patients seen by the writer, 57 were Brahmin and 25 belonged to well-to-do non-Brahmin families (*vide* Chart 5).

The disease is seen proportionately more among the over-fed children of the rich than among the ill-fed children of the poor, who cannot afford to give their babies anything else except mother's milk. The disease is also sometimes seen in the children of the poor who feed their little ones with rice or conjee from early infancy.

(7) *Distribution according to Sex.*

In the assembled data from the writer's series of cases numbering 374 in all, it is found that 222 of these cases were male and 152 female.

The health officer's statistics of mortality from the disease in Calcutta shows that on an average the proportion of deaths among male to female children is about 302 to 248.

The first child of the parents and the first male child after several female ones seem to be affected more. Such children generally become the idol of the whole family and are fed on rich food by the over-affectionate parents and grandparents.

(8) *Distribution according to Age.*

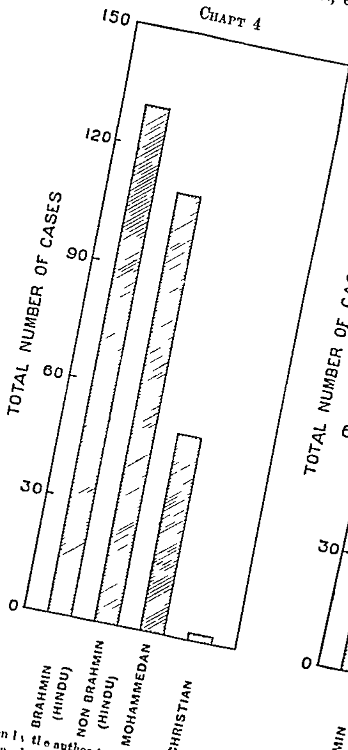
Infantile biliary cirrhosis is a disease of infancy and childhood. The greatest susceptibility seemed to be between six and twenty-four months. It may be noted here that this is generally the period of dentition of the child and also of reconception of the mother. In 57 cases in the writer's series the mother had become pregnant once more when the child was only several months old. The disease is rarely seen before six months or over three years of age.

An analysis of the 374 cases seen by the writer is given below.

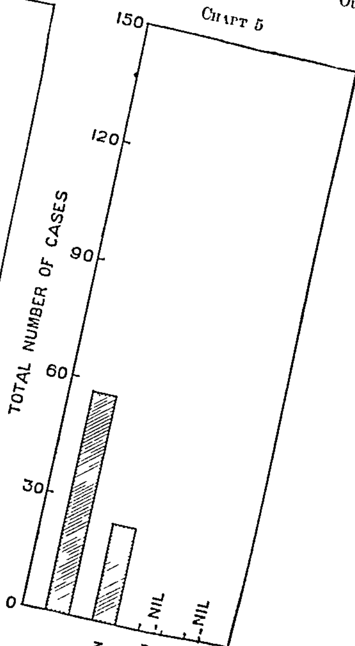
Age group in years when the patient was seen by the writer.	Among Bengalee Patients (Total 292 cases).				Among Madrasee Patients (Total 82 cases).			
	Male.	Female.	Total.	Percentage.	Male.	Female.	Total.	Percentage.
0—1 year ..	64	50	114	39·0	14	11	25	30·5
1—2 years ..	102	68	170	58·2	35	20	55	67·0
2—3 years ..	5	3	8	2·8	2	0	2	2·5

(6) *Distribution among Hindus according to Caste and Social Conditions*

In *Bengal* infantile biliary cirrhosis is seen more among the children of the Brahmin and high class Hindus, e g, the Kayasthas and the Vaidyas Out of



as seen by the author (according to classes) in Bengal during the last seven years



Cases seen by

CHART 8.

NUMBER OF DEATHS

220
200
180
160
140
120
100
80
60
40
20

0-1 1-5 5-10

AGE GROUPS IN YEARS

DEATHS FROM INFANTILE BILIARY CIRRHOSIS OF THE LIVER (10 YEARS' AVERA
IN CALCUTTA ACCORDING TO AGE AND SEX

MALE 

FEMALE 

The writer tried to get information as to the time of onset of every case seen by him, but in most cases it was found difficult to obtain any correct information

CHART 6

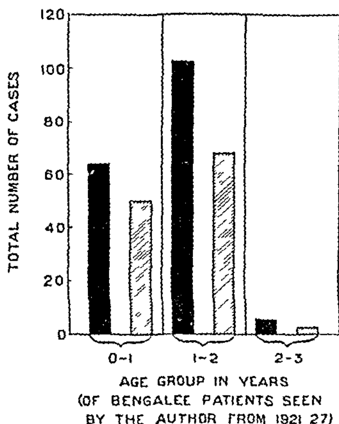
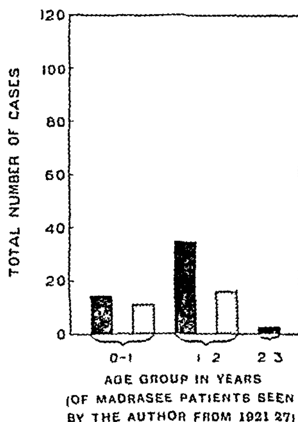


CHART 7



MALE ....

FEMALE .

on this point The statistics of age of onset of the above 374 cases, as learnt from their parents or relatives, are given below

Age of Onset			*Number of Cases*
3—6 months	..	..	7
6—12 „	..	..	206
1—2 years		..	151
2—3 „		..	10

In most of the cases seen in the second year, the disease started in the first year

The death returns of Calcutta show that the largest number of deaths from infantile biliary cirrhosis occur between 1 to 5 years of age (*vide* Chart 8). It may

except widows; but very few people can get it in sufficient quantity, while in the villages it is not available every day. In the towns where infantile biliary cirrhosis is more prevalent, the middle class people take highly milled rice and very few vegetables or fruits. The dietary of the women especially is deficient in vitamins. The Bengalee Mohammedans, living in the towns, take meat almost daily. In other respects their dietary is similar to that of the Hindus.

The principal food of the *Madrasees* is also rice and there is a similar excess of carbohydrate in the dietary. Rice-water or conjee is given even to children. Brahmins and high class Hindus, among whose children the disease is seen, are strict vegetarians and do not take fish and meat. Dal is taken only occasionally. The people are very fond of pungent condiments and chillies and of tamarinds and dadhi (curd). Vegetable oil is used for cooking food. The Malayalee use cocoanut oil and the Tamils, til oil (sesame oil). These vegetable oils, devoid of vitamins, are the only source of fat to the poor. The rich people take ghee and milk.

(10) *Infectiousness.*

Is infantile biliary cirrhosis an infectious disease?

It does not seem to be a site or house infection. There are two instances on record in which the nature of work of the parents necessitated frequent removal of the families from one place to another, but still there were several cases in these families.

Infantile biliary cirrhosis does not also appear to be a family infection. In India the family tie is very strong and brothers, cousins and near relatives often live together in the same house. If the disease were infectious, there would be a possibility of these being attacked. This does not occur. The disease is generally found to attack the successive children of the same parents. Of 374 cases in the writer's series, there was a history of occurrence of the disease in the brothers or sisters of the patients in 107 cases. In 18 cases, however, there was a history of the disease in cousins or near relatives living in the same house. In the rest of the cases there were no such history.

We have tried to inoculate animals, but have not succeeded in transmitting the disease. Such negative results, however, are of little value.

be presumed that the patients who died in the second year must have been attacked with the disease much earlier.

(9) *Influence of Diet.*

It is suspected that the diet of the child plays some part in the ætiology of the disease. An investigation on this point may be necessary. Only seven cases in our series gave a history of onset of the disease before 6 months of age. All of them did not get any mother's milk and were fed mainly on cow's milk, barley, and patent foods.

Of 206 patients who were attacked between 6 and 12 months, 148 got mother's milk more or less with other food, while the rest (58) did not get any mother's milk. An analysis of these figures may be interesting :-

(1) Those who got mother's milk with other food :—

Mother's milk and cow's milk .. .	70
Mother's milk, malted food and cow's milk with barley or sago	56
Mother's milk, cow's milk and rice .. .	22

(2) Those who did not get any breast milk —

Fed on cow's milk only	10
Cow's milk with barley or sago	9
Fed on cow's milk and conjee	2
Fed on patent foods	37

These patients were either fed on artificial foods from their birth or weaned too early.

Of 151 patients who got the disease between 1 and 2 years of age, 123 got mother's *milk together with other foods When these patients were seen, they* were getting rice, chappatti, sweets, cow's milk and portions of everything that their parents took. The rest of the cases (28) were mainly brought up on cow's milk or milk foods.

The normal dietary of the people of the provinces, where the disease is prevalent, requires some study, as children after dentition are usually given almost the same food as that prepared for the adult members of the family. Thus, *a child one year old may get rice, dal, morsels of chappatti, sweets and a little of* everything that the parents or grandparents may take

It is also suspected by some that the dietary of the nursing mother may have some relation with the disease.

In *Bengal*, rice is the staple food of the people Rice is mixed with dal (pulses), and taken with vegetables and fish. The characteristic of the diet is an excess of carbohydrate. In most cases both the chief meals consist mainly of rice and only a few take flour with the evening meal Fish is taken by all Bengalees

of first showing that the enteric fever of India was the true enteric of Jenner, and his views were confirmed, after he had promulgated them in 1855, by Dr. J. Ewart and Dr. E. Goodeve. Other observers varied a good deal in conflicting opinions. Some indicated a *malarial* origin entirely, some said it was a *climatic* disease, some attributed the disease to the general causes arising from *heat—miasmata of vegetable or animal decomposition* or both combined. But on the whole, the general view was that specific fæcal contamination was the probable cause of the disease.

Before Dr. Scriven pointed out the existence of enteric fever in India, all fevers of the remittent or continued type were classified as 'malarial remittent' or 'paludal remittent with bowel complication' according to the prominence of abdominal symptoms. Then when they began to recognize the existence of enteric fever as a separate entity, the first difficulty that became apparent was how to differentiate definitely between the remittent fevers and those of true enteric origin, and to convince other observers that the true enteric fever of Jenner did really exist in India.

Dr. Woodward believing that one form of fever met with, characterized by an enlarged spleen with a continued temperature, to be the result of the combined influence of malarial poisoning and the causative factor of typhoid fever, proposed the name '*typho-malarial*' which was soon generally adopted. Its relation to the disease now recognized as kala-azar will be referred to later.

Surgeon-General Wool-Freyes also described this latter fever as '*typho-malarial*' —'not a fatal fever, but it causes great prostration and a change to England is absolutely necessary. I am of opinion that it is a climatic, a true autumnal fever. It as a rule commences with sore throat, a peculiarity; the rose spots are invariably present and, in fatal cases, the lesions of Peyer's patches are well marked.'

Dr. Moorhead insisted that 'the infection of Peyer's glands either in the stage of turgescence or ulceration is not a morbid state peculiar to enteric fever alone.' 'It occurs in cholera in protracted diarrhœa, in acute muco-enteritis and as a complication of paludal remittent fever.' He had also observed them in one or two cases of measles.

Thus, it will be seen that the whole question of the etiology and the landmarks of the disease were in a state of transitory unsettlement. Nevertheless, this doubt was gradually resolving itself into definiteness. During the period of varied and conflicting speculations in India as in Europe, typhoid fever and typhus had been grouped together under the term of 'continued fever.' The first clear differentiation of typhoid from typhus resulted from the work of Jenner and Murchison at the London Fever Hospital (1855—1862). So that even before the discovery of the *Bacillus typhosus*, clinicians had gradually adopted a more definite line regarding the landmarks of the continued fevers, and subsequent to 1874 there was agreement among clinicians as to the distinction between the 'malarial remittent' and 'enteric' fevers of India. The former was recognized as due to malaria solely (it included also the kala-azar group)—'it is more or less

SOME OBSERVATIONS ON ENTERIC FEVER IN THE TROPICS WITH REFERENCE TO ITS DIAGNOSIS AND NEW CONCEPTIONS AS TO THE METHODS OF TREATMENT

BY

LIEUT COL F A F BARNARDO, C I E, C B E, I M S,

Principal, Medical College, Calcutta

THE existence of enteric fever in India during the last century was for many years not only ignored, but actually denied even by the earlier physicians of repute Formerly, the conception of malaria so dominated the horizon of the conception of all fevers that nearly every case of pyrexia was relegated to this cause They went so far as to attribute even any ulceration of the bowel to a complication of malaria fever The clinical manifestations of the tropical fevers with their many and varied complications, of mixed and multiple infections as we know them, certainly bewildered our predecessors in Bengal —no matter how careful and accurate were their clinical observations More correct views prevail at the present day owing to the advances made in laboratory diagnosis and technique, and fevers of the enteric group now occupy their true position as the commonest variety of continued fever met with in daily practice in the larger towns

The denial of its existence is but the first of the misconceptions which were (and many are still) extant in the history of this disease Its course, its complications, its dangers are all too little understood, and while great advances have been made by the pathologist in perfecting methods of blood culture, serum and agglutinin reactions peculiarly adapted towards its diagnosis still, as regards treatment, the majority of the profession have still made no progress whatever from the position, occupied by their predecessors, in that they regard nursing as the prime factor in deciding the fate of the individual, treatment only being indicated towards the alleviation of unpleasant symptoms

PATHOLOGY

It was not until 1853 that certain protracted and fatal cases of fever which resembled closely typhoid fever, as met with in England (but modified by climate and the influence of malaria) were pointed out by Assistant Surgeon Dr Scriven of the Bengal Medical Service He separated such cases from those suffering from the so called remittent fevers in India To him is, undoubtedly, due the credit

of first showing that the enteric fever of India was the true enteric of Jenner, and his views were confirmed, after he had promulgated them in 1855, by Dr. J. Ewart and Dr. E. Goodeve. Other observers varied a good deal in conflicting opinions. Some indicated a *malarial* origin entirely, some said it was a *climatic* disease, some attributed the disease to the general causes arising from *heat—miasmata of vegetable or animal decomposition* or both combined. But on the whole, the general view was that specific fæcal contamination was the probable cause of the disease.

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amenable to quinine—it is very rarely complicated with looseness of bowels or with follicular disease' 'It may occasionally be complicated with diarrhœa and dysentery, but there is nothing to show that such complicated cases of marsh or jungle fever are characterized by Peyerian disease of true enteric fever whereas in cases of true enteric quinine will not cut short the fever and the morbid appearances of Peyerian disease are so characteristic that no morbid anatomist can fail to distinguish from all other ulcerative and inflammatory lesions to which the Peyer s patches or the ileum is subject

Then came the discovery of *B typhosus* by Eberth in 1891 followed by that of *B paratyphosus* A (Brion and Keyser) and *B paratyphosus* B (Schottmuller) which settled the disputed points of the clinical pictures of the diseases of this group pointed out by different observers

It is well to remember that the observations of these clinicians many of them most eminent and careful recorders were obscured throughout a century by the mixed and multiple infections and also by secondary infections which as we have seen are practically ever present in tropical conditions They had no skilful laboratory aids to aid them and their helplessness in arriving at a diagnosis is self confessed Now however all is changed The pathologist with his cultural and agglutinin tests has given us definite knowledge and the advance in diagnosis by these methods has been most striking It is by such efforts that enteric fever now occupies its true position as practically the commonest variety of continued fever met with in daily or in hospital practice in India especially in the larger towns

But the biochemist and the therapeutist are still lagging behind The biochemist has elucidated little of the changes in the ultimate metabolism which result from the typho toxin itself while there have been very few researches on the disordered functions of the liver the pancreas or the endocrine glands as a result of this toxin

The frequency of the appearance of acetone in the urine the rise in the bilirubin content in the blood the rise in creatinine and the urea and the altered ratio of free to combined acid blood content are significant of profound changes in the metabolic mechanism during the period of the first two weeks. These observations will form the subject of a separate paper shortly

The therapeutist too has advanced nothing in his treatment methods to assist the body in its fight against the invader or to guard against complications which may involve the patient in new and desperate dangers

Diagnosis

To the modern internist aided by the laboratory, there is little or no difficulty in diagnosing the true nature of enteric cases at any stage of the fever and when the metabolic disorders observed in this disease (many of which appear to be quite peculiar to this infection) have been verified and classified, the task will be easier still

This diagnosis is carried out here from three groups of data, the first two of which are of prime importance : --

(I) The clinical signs and symptoms as indicating the direction of the lines of laboratory investigation :

(II) The laboratory findings :—

(*a*) Blood count (picture),
(*b*) Bacteriological examination of blood, urine,
(*c*) Serological examinations.

(III) Special tests in addition where negative results elsewhere are obtained. These so far are mainly secondary and only help to fix the conclusion already arrived at.

I. *Clinical Signs and Symptoms.*

With regard to the first group, I would draw especial attention to the almost constant occurrence of the five classical signs and symptoms :—

1. A temperature curve, showing continued fever with little remission.
2. A relatively slow pulse ; the pulse-temperature ratio being much below the expected.
3. Splenic enlargement, small but definite ; generally with tenderness on pressure.
4. Toxæmic condition—the typhoid state indicating the profound disturbance, within a few days of the onset, of elimination and an altered metabolism to which alteration the treatment may, with the greatest advantage, be directed.
5. Eruption—often difficult to detect on coloured skins.

II. *Laboratory Findings.*

(*a*) Blood count :—showing—

1. Slight leucopenia—not progressive.
2. Diminution of polymorphs.
3. Relative increase of lymphocytes.

I cannot refer too emphatically to the importance of recording the blood count early in the disease in the tropics. The progress of the body resistance after repeated estimations can be more accurately gauged, while if it has not been done already, then when a rise of temperature and the so-called relapse occurs—there will be no guide to the causative factor of the relapse, and, especially, attention will not be drawn to the possibility of the presence of kala-azar, either as a primary factor or as a secondary complication, from the progressive leucopenia.

(*b*) Bacteriological examinations.

1. *Hæmoculture.*—The isolation of typhoid bacilli from the blood.

This is unquestionably the most satisfactory method of diagnosis and should be employed whenever the facilities exist, in every case of undiagnosed pyrexia in the tropics. A successful hæmoculture furnishes the only conclusive evidence

amenable to quinine—it is very rarely complicated with looseness of bowels or with follicular disease 'It may occasionally be complicated with diarrhoea and dysentery but there is nothing to show that such complicated cases of marsh or jungle fever are characterized by Peyerian disease of true enteric fever whereas in cases of true enteric quinine will not cut short the fever and the morbid appearances of Peyerian disease are so characteristic that no morbid anatomist can fail to distinguish from all other ulcerative and inflammatory lesions to which the Peyer s patches or the ileum is subject

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Spleen,
Mesenteric glands, } in fatal cases.
Heart: endocarditis,

Sputum: after the seventh day.

Milk of nursing women.

Abscesses, pyæmic in nature, and in the cerebro-spinal fluid, as early as the tenth day.

II. *Chronic Stages.*

In the gall-bladder for years.

Pus in abscesses, either in connection with bone or the soft tissues.

Excreta of carriers; stools, urine.

It will be well just here to refer to the *morbid anatomy* associated with this disease. The local lesions which are persistent from the onset will be remembered as mainly affecting Peyer's patches in the alimentary canal. Infection of these is followed by—

1. Hyperplasia, during the first week.
2. Necrosis and slough formation and separation of these in second week. The further progress of the case and indeed the ultimate fate of the individual frequently depends on the infection of these sloughs by pathogenic bacteria (strepto- or staphylococci) within the lumen of the intestine.

(c) Serological examination.

Widal reaction; positive in 95 per cent of cases, not positive before eighth or tenth day.

The Widal test should be repeated: a rapid rise in the curve of the agglutination titre is of great diagnostic value. Dreyer's technique has been uniformly adopted and has been found to give the most satisfactory and dependable results.

Some few irregularities in the Widal reaction have been noted. It has been found positive in non-typhoid infections in recently inoculated persons, or in those who have suffered from a recent attack of enteric. and in carriers.

A positive standard of agglutination is accepted by us, if positive, in dilutions of—

1 in 80 for *B. typhosus.*
1 in 20 for *B. paratyphosus*, A.
1 in 1000 for *B. paratyphosus*, B.

Figures have been worked out from the records of the Medical College Hospitals for the last few years comprising a very large number of cases of the enteric group. In all cases only those were taken in which the basis of diagnosis had been either:—

(1) Isolation of the causative organism from the blood (in most cases) or from the urine or stool in a small number of cases.
(2) Positive agglutination test for *B. typhosus* in at least 1 : 80, but mostly in higher dilutions.

that the patient is suffering from active typhoid fever and can hardly be said to be open to fallacy Unfortunately frequently however, the usefulness of this method is limited by the short duration of bacillæmia in the majority of cases Thus it will be apparent that unless during the initial stage a diagnosis has been made on positive findings in the actual isolation of one of the typhoid group of organisms when a secondary infection becomes superimposed (as I shall hope to show is almost invariably the case especially in complicated cases) this will so obscure the whole picture that the true nature of the relapse or continuance of the fever will be with difficulty recognizable

The importance of early diagnosis is important also from the point of view of treatment for, by specific therapeutic agents it is often possible to anticipate and prevent these secondary infections or to raise the resistance of the body before the new onslaught arrives Then once a positive finding of *B typhosus* has been obtained, it will be realized that the battle is to be a long one and that special attention will have to be devoted to encouraging the biochemical mechanism to turn out its choicest anti bacterial substances in ever increasing amounts as well as to support every organ in the body from being wearied out and exhausted in its continued struggle

I wish to lay great stress indeed on this new conception of handling a case suffering from the disease by intelligent anticipation of conditions which may threaten the successful fight put up by the body against the organism especially in the prevention of heart failure the prevention of hyperpyrexia the prevention of sapræmia—either of bacillary or metabolic origin—through the hundred and one ulcers of the intestinal canal and specially the prevention of the passage through it into the blood stream of *streptococci* or *B coli*—causing a definite septicæmia which is followed by hæmorrhage perforation etc and has such a high percentage of mortality With us here in Calcutta the policy of drifting and leaving all to the nurse and Nature has now been definitely abandoned

Blood culture has been positive in 87 3 per cent of cases admitted to hospital during the first week

2 *Culture of Excreta* —

1 Stool

2 Urine

Both of these are important and serve to act as important indicators especially the latter, to the widespread loss of resistance of the body tissues

With regard to the distribution of the bacilli in the body, the following results have been obtained in the last 150 cases —

I *Acute Stages*

Bacilli can be found in the Blood 3 to 10 days

Stool early in the disease up to twelfth day in an ordinary case

Bladder sometimes as early as the third

Rose spots on third to seventh day

In this connection, it is interesting to refer here to the accuracy of the clinical records of the early observers in India. As has been referred to in my opening remarks, they were led to classify one group of cases as typho-malarial in origin; cases in which the fever and the spleen were thought to be due to malaria, while the bowel complications were ascribed to typhoid fever. All such cases now we probably correctly interpret as cases of kala-azar.

(*a*) Several cases of typhoid fever were admitted to hospital which were bacteriologically found to be due to either typhoid or paratyphoid A. or B. infections which, towards the end of the third or fourth week, developed clinical signs of kala-azar and the blood culture showed flagellates. It is difficult to say what relationship exists between the two diseases and why kala-azar is found to simulate or follow after an attack of the typhoid group of fevers. Simply lowered vitality will not account for it, as the same result is not so often observed after an attack of pneumonia or influenza, whooping cough or measles. I am publishing a series of 200 cases of kala-azar resembling typhoid fever and vice versa at an early date, which I think will be of the greatest interest.

X. *Helminthic infections* *: These in the tropics must always be remembered as a possible factor of disease in every case.

(*a*) The patient, a boy of 9 years, came in with a paratyphoid A. infection and had a perforation which was cured by operation. Six days after his discharge from hospital, he was readmitted with the same type of continued fever; the natural presumption being a relapse. All the laboratory findings proved negative. At last, towards the end of the second week, helminthiasis was suspected. 'Santonin' was given and as soon as a multitude of round-worms was passed, the temperature quickly came down to normal.

(*b*) Another patient, a boy of 5 years, was running a continuous fever, comatose, but with a high temperature and a relatively quick pulse. It was thought that the case might not be one of enteric fever, but of malaria or of ascaris infection. 'Santonin' was administered, several round-worms were passed, the fever quickly disappeared and he made an uninterrupted recovery.

This case, and many other cases, bring out the conclusion that:—

1. Helminthiasis in Bengal is a very constant concomitant infection of enteric fever.
2. A febrile condition simulating typhoid fever, but due to ascaris infection exists.
3. Apparent relapses of typhoid fever are sometimes due to this factor.

This is especially important with reference to children.

(*c*) Another case of interest may be referred to. The patient was admitted for dysentery and was passing blood and mucus in the stools; the fever was inconspicuous. *B. paratyphosus*. B., was isolated from the stool in the course

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* Several examples of confusing clinical pictures were shown with charts, etc. Some of these were mixed infections, some were secondary infections and some were due to multiple infection.

Incidence in those cases is as follows —

Typhoid	79 per cent
Para A	15 7
Para B	4 6
Para C	0 65 ,

The actual incidence of paratyphoid fevers is probably higher in reality amongst the general population of towns as owing to the mildness of the symptoms in these infections many cases do not come into hospital and are often not diagnosed at all Further unfortunately sometimes we do not get our typhoid cases early enough to isolate *B typhosus* from the blood

We have noted no clinical features to differentiate these from typhoid with any certainty Typhoid may be of the very mild type and on the other hand para typhoid may present the worst and most serious symptoms Generally however the paratyphoids have got milder symptoms and less toxæmia Hæmoculture and Widal s reaction will generally settle the diagnosis

III *Special Tests*

(*a*) Marris' atropine test for vagotonia is of the greatest value positive from first week

This test is carried out as a routine practice in all cases of continued fever and has been found to be positive in 84 per cent of cases of typhoid This shows that the test is of immense service to the general practitioner especially where a well equipped laboratory may not be available for bacteriological examination

(*b*) *Diazo reaction* has not proved of such value as malaria also gives a positive test

(*c*) *Russo s methylene blue test* has not been very accurate but is more constant than the diazo reaction

DIFFERENTIAL DIAGNOSIS

As previously pointed out early accurate diagnosis is important for (1) the patient as it gives him better chance of early recovery and the so called relapses are much better understood and dealt with and for (2) the community in preventing infection to those of his immediate family members especially in more ambulant cases

Our difficulties arise under this head —

(1) From anomalous signs of the disease itself

(2) From other diseases simulating it

These may be classified according to the duration of the onset of disease —

I *During the stage of invasion with severity*

(1) Small pox—(*a*) The seasonal prevalence of small pox is in December January and February when typhoid incidence is low (*b*) The characteristic eruption occurs on third or fourth day

5. Pulmonary complications—capillary bronchitis or tiny patches of pneumonia, especially in the early stages of the disease, perhaps due to the spraying of the bacilli over the tiny capillaries of the lung itself. If it occurs during the last two or three weeks then it is of the gravest import, generally due to the failure of the auricular elasticity in maintaining the intra-pulmonary thoracic pressure.
6. Hæmorrhage, peritonitis and perforation, due, I am convinced, to the invasion of the Peyerian patches by bacilli of increased pathogenicity dwelling in the intestinal tract. Most commonly streptococci; these may cause lysis of the ulcerated areas, the smaller vessels may be attacked, the lumen occluded by coagulation. The clot may be next invaded and extension to the proximal end of the clot result and a free passage to the blood-stream ensue. If these be streptococci of the hæmolytic group, then the results may be serious, as the blood-stream of many fatal cases reveals the presence of these.

Sometimes these are *B. coli*; mostly not fatal, but are frequently the cause of a secondary continuance of pyrexia.

Treatment.

This naturally falls under two heads:—

(1) An attack on the hostile organism and the planning out of the assistance to be rendered to the body in its defence against that organism.

(2) Prevention of complications and sequelæ of the disease, either due to the *B. typhosus* itself or from secondary infections or to the break-down of any of the elements of the body machinery (heart, liver, kidneys) unable to stand the strain of continued defence.

For any direct attack on the bacillus itself I have not found any specific therapy (vaccine or serum) of any value at any stage of the disease, but the help afforded to the body by intelligent generalship may be very material indeed by intelligent anticipation of the conditions likely to threaten the successful fight put up by the body and by the prevention of these conditions from encroaching on the arena of conflict. I claim that the disease can be brought to a more successful termination with more uniformly good results, and with a minimum of untoward symptoms and complications, if we attempt to understand in what manner we can help the body metabolism to elaborate its biochemical anti-bacterial substances. It should thus surely be recognized now that the older policy of drift, leaving everything to the mercy of the nurse and Nature to settle, must be superseded by an active direction on the lines indicated above.

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1. Meteorism or tympanites.
2. Toxæmia.

of routine examination for the detection of dysentery bacilli and subsequently the patient's serum agglutinated in high dilutions to *B paratyphosus B para typhoid* B causes more colitis than enteritis and so many cases like the above may cause difficulty One patient a Hindu male showed jaundice diarrhœa almost cholera like and a febrile condition ill defined The Widal reaction was positive for *B paratyphosus* B at 1 100 He recovered

Paratyphoid B infection frequently causes hepatitis and cholangitis with incipient jaundice and without a routine blood culture in every case the true nature of such a condition may be easily missed

(*d*) One patient was admitted to hospital with a high temperature and marked pain in the right iliac fossa as appendicitis' and was subsequently proved to be a case due to *B paratyphosus* B by bacteriological tests

In conclusion on the question of diagnosis I would like to summarize in five main points —

(1) The importance of establishing the diagnosis early for the safety of the patient and community

(2) The fact that true relapses are uncommon in typhoid fever but that the relapses seen are mostly due to secondary multiple or mixed infections Blood counts and cultures every seventh day a Widal at tenth day and every seventh day subsequently, will do much to elucidate the causative factors

(3) Of all the diagnostic measures during the first week none is more reliable than hæmoculture

(4) It is not always easy to differentiate between the paratyphoid groups and true typhosoid and practically impossible to be certain without accurate laboratory findings

(5) The possibility of cases of pyrexia of uncertain origin being obscure cases of the enteric group should always be borne in mind and that it is better to treat such cases as enteric until definitely proved otherwise

Prognosis

The mortality in the Medical College Hospitals is now less than 5 per cent of cases An uncomplicated typhoid case with the adoption of recent conceptions in treatment rarely ends in death Special features affecting the prognosis have been noted to be of serious import —

1 Nervous symptoms, marked delirium

2 Pulse, pulse rate constantly over 120

3 Hyperpyrexia

4 Abdominal symptoms meteorism and diarrhœa are unfavourable symptoms often benefited by repeated enteroclysis carried out with care

5. Pulmonary complications—capillary bronchitis or tiny patches of pneumonia, especially in the early stages of the disease, perhaps due to the spraying of the bacilli over the tiny capillaries of the lung itself. If it occurs during the last two or three weeks then it is of the gravest import, generally due to the failure of the auricular elasticity in maintaining the intra-pulmonary thoracic pressure.
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15 Bacilluria
16 Thrombosis of veins
17 Relapses

Seventy six per cent of enteric cases are uncomplicated and they are cured with or without any form of treatment so one must assume that an acquired immunity can be and is generally gradually effectively established

Of the remaining 24 per cent we find—

	Per cent	Reducible to	
(1) Nervous complications in	11	10	in 450 cases,
(2) Hæmorrhage ,	10	2	
(3) Peritonitis ,	14	4	
(4) Hyperpyrexia ,	11	1	
(5) Relapse	18	3	

Sixty five per cent of these were due to streptococcal infection the streptococci being isolated from the blood stream

These 24 per cent of cases are those in which our skill and efficiency is to be shown by bringing them to a successful recovery

The main principles of treatment may be referred to under the following heads —

(1) General management, mouth hygiene —Cleanliness to prevent re infection of the patient himself and to prevent infection of the 1 000 ulcerating intestinal surfaces with mouth bacteria

(2) Diet —Nature of food ? Quantity of food ? Method of taking ? How often ?

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(2) Diet —Nature of food? Quantity of food? Method of taking? How often?

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whey with lactose added. I am convinced that the slogan to be adopted in all such cases is 'relieve the body of its load and the body will cure itself.' In other words, lighten the burden of endogenous metabolism by presenting only those food-stuffs whose intermediate products, the amino-acids, require as little detoxication by the liver as possible, freeing the efforts of that organ largely for the uninterrupted elaboration of the antibodies necessary to gain the acquired immunity. This will preclude all the proteins of meat—even, in many cases, that of caseinogen. Substitutes must be found in the vegetable juices and the whey of milk, etc., having regard to the proper preservation of the nitrogen equilibrium. The administration of carbohydrates (preferably lactose) to neutralize the ketone group resulting from protein metabolism must not be deficient, otherwise those substances will accumulate in the blood and disturb the alkaline base reserve. The importance of the preservation of the latter by alkaline fruit juices in large quantities must never be forgotten. Elimination of waste products through the skin must be encouraged as much as possible as otherwise the difficulties of preservation of the alkaline base reserve as regards carbonates and phosphates by the lungs and the kidneys respectively will be rendered increasingly difficult.

Retention, too, of the intestinal contents must be guarded against and the quality of the intermediate products of metabolism within the alimentary canal must be modified by a choice of food-stuffs, so as to lower rather than raise the toxicity of the coccal and coli group within that canal; otherwise they may become pathogenic during the period of weakened resistance and invasion of the tender scars of the Peyerian areas may result in a penetration even to the blood-stream.

The activation of the endocrine board or directorate, specially the thyroid and the adrenal, under whose directions the whole biochemical process of the defence measures of the body are elaborated, must be maintained by adequate vitamin administration. The juice of many oranges, pine-apples, pomegranates, should be administered daily, due care being taken not to allow unripe fruits to be taken, as thereby the calcium ions of the blood will be unduly fixed and ultimately eliminated in the urine with a marked demineralization and loss of alkaline base, with the symptoms of increased irritability of nerve trunks, headache, increased tendencies to hæmorrhage and delayed convalescence.

All these points can only be dealt with by repeated urine and blood examinations, noting each change in the alkalines and urea content, etc., and altering the dietary accordingly.

(3) Hydrotherapy.

(*a*) Water per mouth in adequate and suitable quantities to enable the kidneys to maintain the quantity of blood constant.

(*b*) Sponging; repeated, especially with hot water, as the fall of temperature is more constant and certain than if carried out with cold.

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Intestinal Antiseptics.—The vulnerable condition of the Peyerian patches will, while sloughing and after the slough has separated, render it imperative to endeavour to keep the fluids that bathe these as free from bacteria as possible. Similar ulcers on the skin are treated with antiseptics. Why not the intestine? The difficulty is the selection of the most suitable one. There have been many such in vogue for years and many are still popular. I myself have given exhaustive trials to chlorine water, acetozone, liquor hydra, perchloride and many others with but little effect. Perchloride of iron, however, has been now used by me for over 20 years and has always given me the most satisfactory results; *but* it must be given in therapeutic doses every four hours, one hour after feeds. It cannot be said to be a disinfectant or an antiseptic, but it certainly does render the intestinal contents more uncomfortable for the development of the flora of the intestinal canal. It also combines with the sulphur molecule of the intermediate product of metabolism in the effluent and thus reduces the chance of meteorism and prevents excessive gas formation, the stools becoming black and inoffensive. It is useful in that it tends to coagulate the mucinogen poured out by the goblet cells into mucin and so preserves the natural integrity of the delicate cells composing the intestinal mucosa by coating them over in its normal manner from attack by bacterial or metabolic toxins. Its presence is necessary for the muscles of the heart and the blood vessels and by its administration one provides an abundance of iron for the formation of new red blood corpuscles and the hæmoglobin content of the blood. In enteric, the reticulo-endothelial system is certainly overactive in breaking down red cells during the fever period, and it is possible that a large proportion of the iron molecules thus set free cannot readily be rebuilt up into hæmoglobin with the result that when iron be not administered, repeated examinations show a progressive fall in the hæmoglobin and red blood cells whereas with the administration of iron from the outset both of these show a definite gradual rise all through the febrile attack.

If given in full doses, it may be considered to be a styptic and so stop capillary oozing from the ulcers in the intestine. This is especially beneficial if administered without food and repeated every four hours. It is in some way peculiarly hostile to the development of streptococci anywhere (cf., its use in erysipelas).

The usual objection that iron will cause constipation and upset the digestion has been handed down for many years from the use of iron in its carbonate and sulphate salts, and in the scale preparations, which certainly do produce constipation and upset the digestion as these alkaline preparations unite with the HCl of the stomach and form nascent chloride of iron which is very astringent; spasm of the pylorus follows with complete interference with the movements of the pyloric portion of the stomach and the duodenum.

Secondary infections.—These are notably due to—

1. *B. coli.*
2. Streptococci.

The adverse effect of hyperpyrexia on the nervous system is too well known to be overlooked. Temperature uncontrolled leads more frequently than not to an early derangement of the nerve centres. In my ward, the temperature is never allowed to go over 102·4°, if humanly possible, by sponging. The elasticity of the capillary circulation is thereby encouraged and maintained with the return of the blood to the heart. Further, it is interesting to note that if repeated sponging with hot water does not reduce the temperature in 18 hours in almost every case there is some other factor than *B. typhosus* which is disturbing the heat regulating centre. Its efficiency cannot be too highly exalted.

(4) Medical treatment generally is chiefly directed towards the free use of alkalis in addition to what can be absorbed in the food.

(5) The body machinery in any of its sections may threaten to break down under the strain of a three weeks struggle. Such failures must be anticipated and prevented if possible. The most serious in this disease is the weakness of the cardiovascular mechanism. Whatever the immediate condition, the possibility of this becoming exhausted must be guarded against. In order to control the genetic centres of the heart itself and to preserve the ventricular muscle from exhaustion, digitalis given per mouth in therapeutic doses every six hours *from the very beginning*, is the most efficient agent. This is done as a routine treatment to block the bundle and vagal tissues and hold it in control before the typho toxin so raises its excitability as to refuse control. To wait until the first sound is disappearing, marking the loss of elasticity of the ventricular muscle, is to abandon all possibility of rendering any assistance to it. The reluctance to administer digitalis is generally due to a supposition that digitalis is not absorbed in fevers; consequently its administration is generally restricted, when obvious failure has set in, to a hypodermic injection of digitalis and strychnin, both of which are not only worse than useless especially in the late stages of the disease, but are directly harmful. Most of my cases progress most favourably with a pulse rate of 90 or thereabouts, no matter what the temperature. By this means each organ is enabled to obtain as full a supply of blood as possible; the auricular diastole favours the emptying of the liver and its consequent adequate physiological response and activity which in fever is so important. The auricular diastole prolonged maintains the intra-pulmonary thoracic pressure, lessens the chances of pulmonary congestion which is so serious a complication during the third week of the disease. The increased rate of respiration will show the difficulty experienced by the lungs in maintaining the alkaline base reserve as regards carbonates. Above all the elasticity of the peripheral circulation is favoured and maintained by the action of digitalis with the aid of hydrotherapy on the capillary muscular structures and especially on the efforts of the kidney both in elimination and in the preservation of the alkaline base reserve as regards phosphates.

DISCUSSION.

Major G. Shanks, I.M.S. (Bengal) : My comments apply partly to Col. Barnardo's paper read yesterday and partly to that of to-day.

The question of secondary infections is of much interest to bacteriologists as well as to clinicians, and some of our most notable findings have been made in connection with the enteric group.

In a number of cases, now about eight, we have secured a growth of the enterococcus (called sometimes *S. fæcalis*) in the blood of patients who seemed to be having a relapse during their convalescence. This is interesting in view of the fact that the pathogenicity of this organism has often been questioned. We are convinced that it undoubtedly is pathogenic, particularly as a secondary invader, but that its virulence is considerably lower than that of true streptococci. In a few cases, it has been recovered from the blood coincidently with *B. typhosus* during the course of the enteric period of infection.

Dr. B. Sahai (Gwalior State, B. India) : Col. Barnardo has brought out the value of recognizing the rôle of secondary infections in explaining the various complications of typhoid fever, but in my opinion the question of secondary invaders as the cause of relapses should be left alone. These do not depend on secondary infections. We have bacteriological evidence against it. Many radial cultures become positive again at the onset of a relapse and the rose red spots on the body appear once more. The concentration of agglutinins also occasionally shows an increase.

With regard to the question of diagnosis, fæcal culture has a very important place, but the test of real practical value in hospital and private practice is that of the agglutination. While considering the value of this test, there are two important points which should be kept in mind, one being the knowledge of the fact that persons who had a previous inoculation give a positive finding. The second is the progressive increase of concentration of agglutinins as the disease progresses.

Dr. Abraham S. Erulkar (Bombay) : I do not agree with Col. Barnardo that relapses and complications of typhoid fever are due to secondary infections. The clinical picture and blood picture of typhoid relapses are exactly the same as in the original typhoid attacks. I should like to protest against the starvation line of treatment given to typhoid cases in this country. A typhoid case must be fed well if we expect him to fight his disease successfully. His diet must meet the caloric requirements of the patient—at least 2,000 calories in an Indian patient. It must be easily digested and must not irritate the Peyer's patches. I usually give my patients milk, honey, sugar, cereal conjees, bread, butter, eggs, boiled fish and chicken. On a fuller diet such as this, the incidence of complications and mortality is considerably reduced and convalescence is shortened. Actually the percentage of hæmorrhage and perforations is halved. My experience at King Edward Memorial Hospital, Bombay, bears out the above conclusions.

Dr. Robert J. Gittins (Central Provinces) : My experience in the Hoshangabad district of the Central Provinces has led me to regard enteric fever as quite infrequent in the country towns and districts of the Central Provinces. The cardinal signs and symptoms of enteric are not often seen. The blood tests which I have done in those cases most resembling enteric have usually not supported the diagnosis of enteric I

Uncomplicated typhoid cases very rarely suffer from hæmorrhage perforation and peritonitis When they do occur they are most commonly due to streptococcal invasion The streptococci enter through Peyer s patches If the slough separates about the tenth day probably the raw surfaces left on the hundreds of ulcers are only open to the passage of chemical toxins the products of metabolism on the other hand an early invasion of the slough frequently results from the presence of streptococci whose virulence has been raised by injudicious diet and treatment Invasion of the capillary walls leads to thrombosis within the capillary then *invasion of the clot then passage into the blood stream making their presence* apparent clinically by a sudden rise in the pulse rate and an abundance of urine The blood pressure rises with the appearance of the new organism in the blood Then follows expulsion of the clot through the disorganized vessel wall and hæmorrhage results as a normal sequence

The routine treatment of typhoid cases in my ward is to anticipate any invasion of streptococci and to inject polyvalent anti streptococcal serum in 25 c c doses repeated twice or thrice by the end of the second week A wall of antibody is then raised in the blood stream to prevent the chances of a successful streptococcal septicæmia which is hardly found now in any of those who come to hospital and who are put on this line of treatment with an intestinal antiseptic as iron especially directed to the reduction of the virulence of the streptococci present within the intestine But those few cases in which it does occur either come very late into hospital or their intestinal canals have not received due care and attention from the attending physician, and the flora have assumed an abnormal pathogenicity and virulence

To conclude, the treatment in typhoid fever has up to now been dictated more often by a policy of drift and a desire to deal with symptoms only as they arise rather than by a conception of the pathology of the disease and anticipation There has been no agreed approval on the importance of preventing the ulcerated surfaces becoming infected with the bacteria of the intestinal canal and the feeling of helplessness which the practitioner finds in the impossibility of utilizing the various intestinal antiseptics has led unfortunately to his abandoning all attempts at antisepsis with the result that meteorism, secondary infection and hæmorrhage are actually encouraged

Lastly, it will be remembered that devitaminization and demineralization of the body is a definite entity in this disease, and if not attended to, will give rise to a series of symptoms in convalescence whose seriousness is not far removed from those of the actual typhoid infection itself

I have dealt very briefly with the details of therapeutic procedure as time is very limited, but in conclusion, I am sure that I can claim that by following the above methods which have only been sketched out more uniformly successful results will be obtained than by any other method of treatment hitherto reported and, if this be conceded, a definite advance may be recorded in the methods of treatment of this very dangerous and prostrating disease

probably for the very common occurrence of relapses in typhoid as compared perhaps with the Philippines.

With regard to Dr. Gittin's contention that typhoid fever was not as frequent in India as people thought, he would point out that typhoid was very common in towns and cities, especially in Calcutta, but that it was probably rarer in the districts owing to a less persistent virulence in the mofussil generally.

should like to ask if such is the experience of others, who are in a position to check the diagnosis of enteric by careful laboratory tests I have a suspicion that typhoid is far too readily diagnosed In connection with this, I should like briefly to refer to the frequency with which one condition, viz, urinary fever is met with and the way in which it may sometimes simulate enteric I have found that quite a number of such cases while responding rapidly to appropriate treatment such as is successful in frank cases of urinary fever, have shown no clinical sign of sepsis of the urinary tract No doubt, an organism could be isolated from the urine in all these cases but I have not had the opportunity of utilizing cultural methods regularly The diagnosis has thus often rested on the result of treatment Just before leaving for this Congress a girl was sent to me as convalescent from enteric, but there was still considerable irregular fever, the urine did not contain any cells However, she was put on Mist hexamine cum acid sod phosphat with the result that she was practically afebrile in three days when I last saw her I could quote quite a number of similar cases in all of which enteric could reasonably be suspected May I ask if such has been the experience of others if others are finding that their clinical diagnosis of enteric is being supported by the laboratory findings in most cases and whether we are not somewhat too facile in making the diagnosis of enteric?

Dr H de Leon (Philippine Islands) The observations brought out by Col Barnardo are certainly interesting His suggestion that the intestinal haemorrhages are due to the action of streptococci certainly needs consideration although it is hard to admit such a conclusion just at present from evidences given in lieu of the usual accepted view

As regards relapses being caused by secondary infections I would like to say that if they are relapses at all they must be due to the effects of *B typhosus* I have seen many cases of relapse that come to autopsy in the Philippine General Hospital at Manila In every one of these there were seen distinct almost healed lesions in the ileum At one or two spots at the edges of these healing lesions would be observed small acute recrudescing typical typhoid ulcers which would be very difficult to ascribe to secondary invading organisms

Lieut Col F F Barnardo I M S (Bengal) In reply to Prof Shanks acknowledged his most interesting contribution that the streptococcus and enterococcus could assume a definite pathogenic virulence hitherto not understood The supposition that the hemolytic variety was the only one of the group which was really to be feared required reconsideration

To Dr Sahai s statement he pointed out that because the agglutination curve rises in the relapse, it does not necessarily mean that the infecting organism is the same As Dr Lohr pointed out an intercurrent infection might raise the titre and he specially drew *attention to the capability of the streptococcal group in this direction*

He drew attention to the importance and delicacy of Dreyer s technique repeated at intervals to elucidate difficult cases

In reply to Dr Trulkar he did not say that relapses due to *B typhosus* did not occur but that they were rare in comparison with the secondary infections

In reply to Dr de Leon he admitted that his evidence on autopsy must have due weight, but the prevalence of streptococcal infections in Bengal accounted most

The results of sanocrysin treatment have varied considerably in the hands of different workers (*vide* Table I).

TABLE I.

Workers.	Number of cases treated.	Number of cases benefited.	REMARKS.
Le Blanc	18	6	4 died.
Friedman, Kinasniewski and Deicher.	54	19	Exudative cases benefited more than proliferative.
Koch	10	10	....
Jessen	20	11	2 died.
Faber (1925)(10)	40	25	16 became T. B. negative.
Burrell (1926)(11)	20	18	Pneumothorax treatment was adopted in many of the cases.
Wurtzen (1926)	100	64	Smaller doses employed.
Bernard	23	4	....
Faber (Statistics of Danish Sanatoria up to 1st June, 1925).	250	130	35 per cent became T. B. negative.
Gravesen (1925)(12),(13) ..	80	48	Some cases had pneumothorax treatment as well.
Sergent, Bordet, Durand and Kourilsky.	13	4	4 died and 4 became worse by treatment.
Frimodt-Möller(14) ..	27	19	50 per cent improved in stage III and 84 per cent in stage I.
Our series	43	31	19 arrested.

These large variations are apparently due to one or more of the following causes: –

1. The types of cases selected for treatment have not been identical in the hands of different workers. Some have treated exudative, whilst others have selected proliferative cases.
2. The dosage and intervals have varied.
3. Artificial pneumothorax treatment has been simultaneously applied in a large number of cases by some, thereby vitiating the results of the sanocrysin treatment.
4. The standard of classification of the cases of pulmonary tuberculosis chosen for treatment has not been uniform.
5. The results have not been judged by a common recognized standard.

Dosage.—From the results of his experiments, Mœllgaard advocated doses of 50 to 100 cg. of sanocrysin intravenously for the human subject. He considered a high concentration of the drug in the blood was essential to produce a bacteriolytic effect. Later workers have considered that smaller doses are equally beneficial, and are even more advantageous as sanocrysin shock is prevented by smaller doses. Poix(15) commenced with 5 to 10 cg. and ended with 80 to 100 cg. Klemperer(16), Wurtzen(17) and others have advocated the smaller doses, whilst Gravesen and other Danish workers have commenced with a larger dose. We began with 10 cg. as a rule and did not exceed 50 cg., though in some cases we have given 80 cg. The maximum total quantity given by us has been 8·5 grammes.

THE ROLE OF GOLD SALTS IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

BY

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Superintendent, Tuberculosis Hospital, Madras,

AND

P K GUNASAGARAM L M P

THOUGH gold has been used in the treatment of tuberculosis in the ancient systems of medicine in India, its rational application in the chemotherapy of pulmonary tuberculosis is of recent origin Under the name of triphal krysolgan, etc, it has been used as a catalytic agent in the treatment of the disease for several years in Germany and other countries, but it is just four years since Mœllgaard advocated the use of sanocrysin in pulmonary tuberculosis, basing his views on the results of experiments on animals

Wright(1), Sweany and Max Evanoff(2), Sweany and Wasick(3) and others *have shown that gold salts have no bactericidal effect on the tubercle bacillus in vitro,* though a slight inhibitive effect is evident in culture media containing sanocrysin

Mœllgaard(4), McClusky and Lichelberger(5) and others have proved that in doses of 1 to 4 cg per kilo of body weight, sanocrysin has no effect on healthy animals, but a much smaller dose has a toxic effect on tuberculous animals Mœllgaard considers that this is due to the sanocrysin splitting up the bacilli in the tissues and liberating the endotoxins In favour of this view, he adduces the observation that the serum of calves suffering from chronic tuberculosis can prevent tuberculin shock Basing his views on this observation, he has advocated the use of an anti tuberculous serum for preventing or counteracting 'sanocrysin shock' in the tuberculous human subject

Le Blanc(6), Jessen(7) and others disagree with Mœllgaard regarding the action of sanocrysin, the effect of which they consider is a purely chemical one due to the metallic action of gold on the tissues, whilst Cummins and Acland(8), Madsen and Morch(9) and others obtained results in their experimental work on animals which indicate that the effect is both chemical and biological

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The dosage of krysolgan which is used as a catalytic agent is much smaller The initial dose is 0 0001 gramme and the maximum 0 1 gramme the intervals varying *from 5 days upwards depending upon the* nature of the reaction following each dose The maximum total quantity given to one case has been 0 34 gramme

Selection of cases —It is generally recognized that the exudative type of case responds better to sanocrysin than the proliferative but certain workers consider that both types are amenable to the treatment Being a chemotherapeutic agent one would expect that the acute cases with little fibrous tissue formation wherein the drug could obtain easier access to the bacilli would benefit more than the fibrosing or fibrosed cases Of the 43 cases of our series 10 only were of the exudative type whilst 33 were fibrocaseous Whilst 87 per cent of the former class improved under the treatment 68 per cent only of the latter type benefited by it The figures are of course too small to draw conclusions from and one would in the ordinary course expect the exudative cases belonging mostly to stages I and II to benefit more from any treatment than the proliferative cases in stage III

Krysolgan on the other hand being a catalytic agent is considered to be more suitable for the fibrosing cases In our series of 41 cases, we found 52 per cent *of the exudative type of cases benefited from krysolgan as against 56 per cent of* the proliferative

Reactions and Complications in the course of Sanocrysin and Krysolgan treatment

Reactions	Sanocrysin cases Total 5[illegible]	Krysolgan cases Total 41
Slight febrile reaction	10	1
Severe and prolonged fever	4	[illegible]
Rigors	1	
Slight albuminuria	2	
Marked albuminuria	6	
Slight hæmoptysis	2	11
Severe hæmoptysis	8	6
Nausea and vomiting	7	[illegible]
Abdominal pains	6	[illegible]
Enteritis	6	1
Exanthems	1	
Stomatitis	1	
Focal reaction	1	[illegible]
Vague symptoms like burning sensations insomnia chest pains weakness etc	[illegible]	[illegible]
Loss of weight	3	[illegible]

Slight rise of temperature was common being observed a few hours after the injection but severe constitutional symptoms were observed in 9 per cent of the sanocrysin cases and 17 per cent of the krysolgan series Sanocrysin shock was never met with and so there was no occasion to use Madlgaard's serum This was

apparently due to the smaller and more cautious dosage. Albuminuria was observed in 8 of the sanocrysin cases, but never in the krysolgan series. This was apparently due to the much smaller doses of krysolgan used. Hæmoptysis was more frequent than under normal conditions, being specially so during krysolgan treatment. Fifty per cent of the krysolgan cases had hæmoptysis and 20 per cent of the sanocrysin cases.

Enteritis and abdominal pain, stomatitis with ulceration near the frænum of the tongue, nausea and vomiting and vague nervous symptoms were observed in a number of cases.

An initial loss of weight was noted being more persistent in the krysolgan cases.

Summary.

1. Of the two gold salts, sanocrysin and krysolgan, the former was found more effective than the latter; 77 per cent being benefited with sanocrysin and 50 per cent with krysolgan.
2. Neither drug could be said to be a specific for tuberculosis. Sanocrysin in the usual doses of 10 cg. and upwards has a chemotherapeutic effect, whilst krysolgan in the prescribed doses of 0·0001 gramme and upwards has a catalytic effect.
3. Krysolgan, even in the smaller doses, produced more severe reactions than sanocrysin.
4. Sanocrysin is of greater value in the exudative cases, whilst krysolgan benefits proliferative cases.
5. Both the gold salts are useful adjuncts to the ordinary treatment. Neither of them has the decisive effect of pneumothorax therapy.

References.

(1) Wright, A. (1926) .. .. *Brit. Med. Jour.*, I., p. 102.

(2) Sweany, H. C., and Max Evanoff (1926). The effect of Sanocrysin on the Tubercle bacillus after long exposure *in vitro*. *Amer. Rev. of Tuber.*, Novr., Vol. XIV, No. 5, p. 523.

(3) Sweany, H. C., and Wasick, M. M. (1925). The effect of Sanocrysin on the Tubercle bacillus *in vitro*. *Amer. Rev. of Tuber.*, December, Vol. XII, No. 4, p. 316.

(4) Møllgaard, H. (1925) .. The theoretical basis of the Sanocrysin treatment of Tuberculosis. *Brit. Med. Jour.*, April 4th, No. 3353, p. 613.

(5) McClusky, K. L., and Eichelberger, L. (1926). The effects of injections of Sanocrysin on normal and tuberculous dogs. *Amer. Rev. of Tuber.*, Novr., Vol. XIV, No. 5, p. 533.

(6) Le Blanc, E. (1926) .. .. Treatment of Pulmonary Tuberculosis with Sanocrysin. Munch. Med. Woch. February 19th, *Abst. Amer. Rev. of Tuber.*, Novr., p. 161.

(7) Jessen, M. (1926) .. .. Treatment of Pulmonary Tuberculosis with Sanocrysin. Munch. Med. Woch. March 12th, *Abstr. Amer. Rev. of Tuber.*, Novr., p. 162.

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Marked albuminuria	6	
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Nausea and vomiting	7	2
Abdominal pains	6	6
Enteritis	6	3
Exanthema	1	
Stomatitis	3	
Focal reaction	3	6
Vague symptoms like burning sensations insomnia chest pains weakness, etc	7	5
Loss of weight	3	6

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Madsen, the honoured guest of the Government at this Congress, has further shown by experiments, on not less than 236 animals, that it is possible to sterilize animals infected by tuberculosis when treated by sanocrysin.

It is most important to make a right selection of cases to be treated by sanocrysin. It should never be given to patients suffering from any kind of kidney affection, or of intestinal or abdominal affections; it should not be given to advanced cases when suffering from toxæmic cachexia.

Captain R. K. Kacker (United Provinces): I have tried sanocrysin in 16 cases at the King Edward VII Sanatorium, Bhowali. The cases selected were those which had not responded to ordinary treatment, but had not much fever or other signs of marked toxæmia. The dosage was that recommended by Dr. Frimodt-Möller, beginning from 0·1 gramme and going up to 1 gramme. No shock and no eruptions were noticed. Discoloration of lips occurred in one case. Anorexia was marked in several cases. My results are not yet tabulated, but my general impression is that it is a useful adjunct to sanatorium treatment. Striking results have been obtained in a few cases, and the drug deserves a further extended trial.

(8) CUMMINS, S L, and ACLAND C M (1926) Sanocrysin in the treatment of Tuberculosis in the Rabbit *Brit Jour Exp Path*, Vol VII, p 47
(9) MADSEN, TH, and MORCH, J R (1927) The treatment of experimental Tuberculosis with Sanocrysin *Acta Tub Scand* II 99 *Abst Tubercle* July 1927, p 474
(10) FABER, (1925) *Proc Nat Assoc Prev Tuber*, p 157
(11) BURRELL L S T (1926) Sanocrysin in the treatment of Pulmonary Tuberculosis, *Tubercle*, July, p 479
(12) GRAVESEN, J (1925) Sanocrysin in the treatment of Pulmonary Tuberculosis *Acta Tub Scand*, I p 326
(13) GRAVESEN, J (1925) Sanocrysin treatment in Pulmonary Tuberculosis *Tubercle* March p 365
(14) FRIMODT MOLLER C (1926) Further observations on Sanocrysin treatment of Indian patients *Jour Christ Med Assoc India*, Septr
(15) POIX G (1926) Sanocrysin Treatment Press Med June 3rd *Abst Amer Rev of Tuber*, Novr 1926 p 160
(16) KLEMPERER F (1926) Treatment of Tuberculosis with Sanocrysin Deut Med Woch Jan 29th *Abst Amer Rev of Tuber*, Novr 1926, p 161
(17) WURTZEN C H (1926) Researches on the effect of Sanocrysin *Tubercle* July, p 496

DISCUSSION

Dr C Frimodt Moller (Madras) During the last two and a half years we have at the Union Mission Tuberculosis Sanatorium at Arogyavaram near Madanapalle treated more than 100 cases with sanocrysin It is interesting to see that Dr Kesava Pai obtains results with sanocrysin similar to those we have had I want especially to draw attention to the value of this drug in the advanced stage of tuberculosis of the lungs Out of 51 cases in stage III treated in the sanatorium 23 or about 50 per cent were 'much improved' by this treatment that is to say, became clinically well We, who know how difficult it is to bring about real amelioration in these advanced cases, are grateful for a remedy producing such results It is a dangerous drug In 25 per cent of all our patients treated with it, the course of treatment had to be given up, as the patients could not tolerate the sanocrysin If proper care is not taken, great danger will occur We have found it necessary to examine the urine of the patients four times daily during the course of treatment, as we have seen albumen appear at one time of the day and not at the other times, the time of appearance changes from day to day In 80 cases treated, albumen was found in 55 During the course of treatment of these 80 patients, more than 11 000 urine examinations were made No new dose must be given until all traces of albumen have disappeared in the urine for more than a week We have never seen shock Our maximum dose is 0 75 gramme Dr Kesava Pai says that sanocrysin has no specific effect on tuberculosis This is not quite correct It is not a specific remedy in the sense that it kills the bacilli in the body in human beings, but it has, nevertheless, a specific affinity to the tuberculosis lesions in the body The sanocrysin acts upon these, and by liberation of protein-containing products produced during the decomposition and dissolution of the exudative tuberculous tissue it stimulates the defensive forces of the body, resulting in an increase of fibrotic growth, and thereby promotes healing of the tuberculous lesion Dr Theodore

than by fat accumulation, after a temporary decrease in weight due to the burning up of the fat accumulated during the period of rest.

In judging the effect of the seasons on weight amongst the generality of tuberculous patients under treatment in hospitals, it is therefore important to eliminate the factors that might temporarily upset the weight curve on account of certain patients losing weight for the time being under the clinical conditions described above. It is also important that the weights of patients in the very advanced stages, who go rapidly downhill in spite of any treatment, should be excluded from the calculations, as such patients unfortunately form a considerable proportion of those seeking admission into the hospitals of this country. In the investigations forming the subject of this paper we have therefore excluded such cases, and, in order to eliminate the temporary factors concerned in pneumothorax treatment, chemotherapy, etc., we have taken the average weights by months, instead of by weeks, in preparing the weight curves. This minimizes the experimental error, though it cannot exclude it entirely. Thus, for instance, a large number of cases commencing either chemotherapy or pneumothorax treatment in a particular month will vitiate the figures for that month, either by exaggerating the drop in the weight curve or by minimizing the rise therein. A preponderance of patients in the final stage of convalescence, where weight ceases to increase, or, in the acute stage, before the commencement of improvement, when the weight will probably be on the falling side, will similarly affect the correctness of the figures, as also acute intercurrent conditions like epidemics of influenza, enteritis and dysentery to which hospital patients, like the general population, may sometimes be subject.

Lunde(1) considers that increase of weight in tuberculosis is due mainly (*i*) to deposition of fat resulting from good feeding and assimilation, and (*ii*) to retention of water in the system depending on the temperature and humidity of the atmosphere. He argues that in the hottest part of summer there is increased evaporation from the body with decrease of water retention, with, at the same time, decreased assimilation due to the heat, both factors leading to loss of weight. During spring and early summer, on the other hand, there is both decrease of loss of heat from the body with the resulting maximum fat deposition and increased assimilation of food, leading to gain in weight. In winter again there is the decreased assimilation due to the severe cold with increased loss of heat by radiation from the body and the consequent increased oxidation of fat and lessened fat deposition, along with increased kidney function and discharge of water from the system, all these factors leading to loss of weight. Lunde by his observations in Norway has produced weight curves which show a slight rise in spring and a higher rise in late summer and autumn, periods of the year when the temperature is neither very high nor very low, and the humidity of the air favourable for water retention, especially in the autumn.

Frimodt-Möller's(2) observations at the Arogyavaram Sanatorium in south India show similarly interesting curves for the weight, but on account of climatic

THE EFFECT OF THE SEASONS ON THE BODY WEIGHT IN PULMONARY TUBERCULOSIS UNDER HOSPITAL CONDITIONS IN SOUTH INDIA

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AND

C A VENUGOPAL L M & S

In all tuberculous conditions including tuberculosis of the lung increase in weight has been generally accepted to be one of the main points in judging the progress of a case towards improvement and recovery Whilst it has been recognized that in the obese form of tuberculosis no great importance can be attached to increase in weight, in the vast majority of cases such an increase is a definitely favourable sign just as decrease in weight is a sign of a run down in the general condition Several conditions have been known to cause a temporary fall in weight in tuberculosis in spite of a general clinical improvement, for instance in the treatment of pulmonary tuberculosis by artificial pneumothorax in the chemotherapy of tuberculosis by gold salts in the treatment of tuberculous conditions by tubercle vaccines and in the physical treatment of convalescing cases by graduated exercises an initial fall of weight is not uncommon in spite of an amelioration of the local condition and improvement in the general health Such a temporary fall in the weight is as a rule, followed by a subsequent increase as long as the favourable progress is maintained

It has been the general clinical opinion on the continent that rest in bed is very important not only in the acute stages of pulmonary tuberculosis but in the fibrosing convalescent stage as well till the temperature drops quite to the normal, though the increase in weight by such a procedure may be due to the deposition of fat in the subcutaneous tissues and elsewhere In England on the other hand Marcus Paterson and others have insisted on the importance of graduated exercises much earlier in convalescence Fibrosis is in fact, considered to be hastened by such exercises rather than by rest for, whilst absolute rest in bed has a tendency to fat deposition graduated exercises by directly influencing metabolism and by auto inoculation lead to an ultimate steady improvement in the affected tissues, and an increase in weight by development of muscular and other tissues rather

Mean Temperature, Rainfall and Humidity in Madras (1923 *to* 1927).

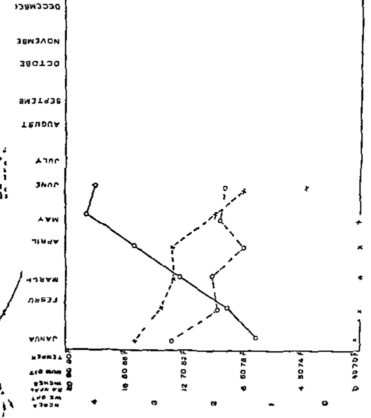
Month.	1923			1924			1925			1926			1927		
	Temperature.	Rainfall.	Humidity.	Temperature.	Rainfall.	Humidity.	Temperature.	Rainfall.	Humidity.	Temperature.	Rainfall.	Humidity.	Temperature.	Rainfall.	Humidity.
January ..	75·2	4·46	79	75·9	2·37	77	74·4	1·33	77	76·7	1.11	79	77·0	0·55	77
February ..	77·7	..	75	77·5	..	72	76·8	..	71	77·6	..	73	79·0	..	74
March ..	81·0	0·64	74	80·8	0·13	71	79·6	2·86	76	82·4	..	74	82·4	..	72
April ..	84·8	..	74	85·6	..	73	84·0	0·05	77	85·7	0·10	72	85·4	..	72
May ..	87·1	0·03	65	88·0	..	66	85·8	4·04	70	88·3	0·10	67	88·5	0·37	65
June ..	88·9	1·96	58	88·1	3·45	58	87·3	0·24	60	89·8	0·40	58	88·0	3·80	60
July ..	86·6	1·65	59	84·3	5·63	72	85·2	3·81	65	85·1	2·77	68	..	..	..
August ..	85·3	3·30	62	85·0	2·57	71	83·4	5·99	73	84·8	4·57	69	..	..	..
September ..	83·4	3·21	71	82·1	9·67	80	84·3	1·35	72	83·8	1·71	75	..	..	..
October ..	80·8	15·89	80	81·8	4·94	77	80·4	16·72	80	81·5	7·36	78	..	..	..
November ..	78·5	3·63	77	77·2	16·01	82	77·7	16·97	83	77·2	12·21	82	..	..	..
December ..	76·5	2·56	78	75·0	0·85	76	75·2	13·48	84	75·9	1·09	76	..	..	..
Annual ..	82·2	37·33	71	81·8	45·62	73	81·2	66·84	74	82·4	31·42	73	..	..	..

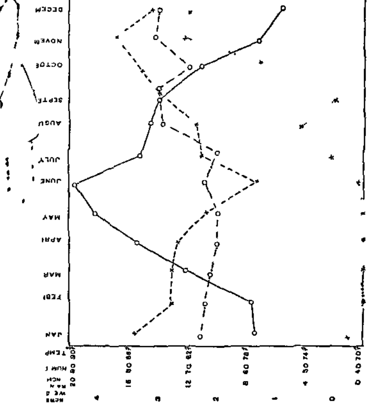
conditions being quite different from those in which Lunde worked in Norway, he found that at Arogyavaram patients showed a slight gain in weight in the later summer months when the monsoon winds cooled down the atmosphere and increased its humidity and a marked gain in weight in the cooler months of October to January, with a fall in weight in the dry and hot months of February to May The daily mean temperature at Arogyavaram is 78°F to 81°F in the late summer, June to October, and 80°F to 85°F in the hotter months, February to June The hot months are dry and the cooler months comparatively humid so that Trimodt Moller's observations confirm those of Lunde that a high temperature and a dry atmosphere decrease weight whilst a lower temperature with humidity tend to increase the weight Winter conditions do not exist in Arogyavaram and the winter dip of the weight curve is naturally absent

The climate of Madras is again different from that of the two localities referred to in the above mentioned observations Madras has a strictly tropical climate and being on the coast the air is humid during the greater part of the year, being less so in the summer months and more so in the cooler months October to March, which coincides with the wet season due to the north east monsoon The mean temperature of the air from March to October varies from 80°F to 90°F maximum temperatures of 105°F to 110°F, being often experienced on some days in May and June The mean daily temperatures from October to March vary from 74°F to 80°F (*vide* Table)

The variations between the maximum and minimum of the day at any part of the year are comparatively slight due to the situation on the coast The rainfall which depends on the north east winds is about 30 inches on the average per year and occurs mostly during the months of August to January coinciding with the cooler months of the year It is evident from the temperature records that the climate of Madras is hot all the year round with the exception of the three months *November to January when it is comparatively cooler the temperature remaining* below 80°F all the day It is apparent therefore that though these three months must have a favourable effect on the progress and weight of tuberculous patients the differences in this respect between these three months and the rest of the year cannot be so marked as in Norway or at Arogyavaram The weight curves fully bear out this view for, whilst the general increase during the months of October to January is uniform all the five years of these observations the variations during the remaining months have been neither uniform nor steady There has, however, been a distinct dip in the curve during the hottest months of the year, i e, April to July

The different curves in the accompanying charts are sufficiently explanatory by themselves It is observed that the temperature and humidity curves vary inversely which is natural in the case of a coast station like Madras The weight curve as will be observed in all the charts is represented in percentages of increase every month over the preceding month In calculating the weight figures, we have eliminated the weights of cases which were admitted into the





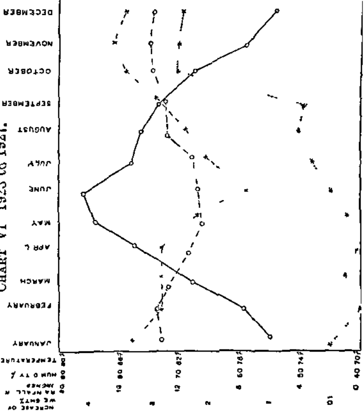


CHART VI 1923 to 1927.

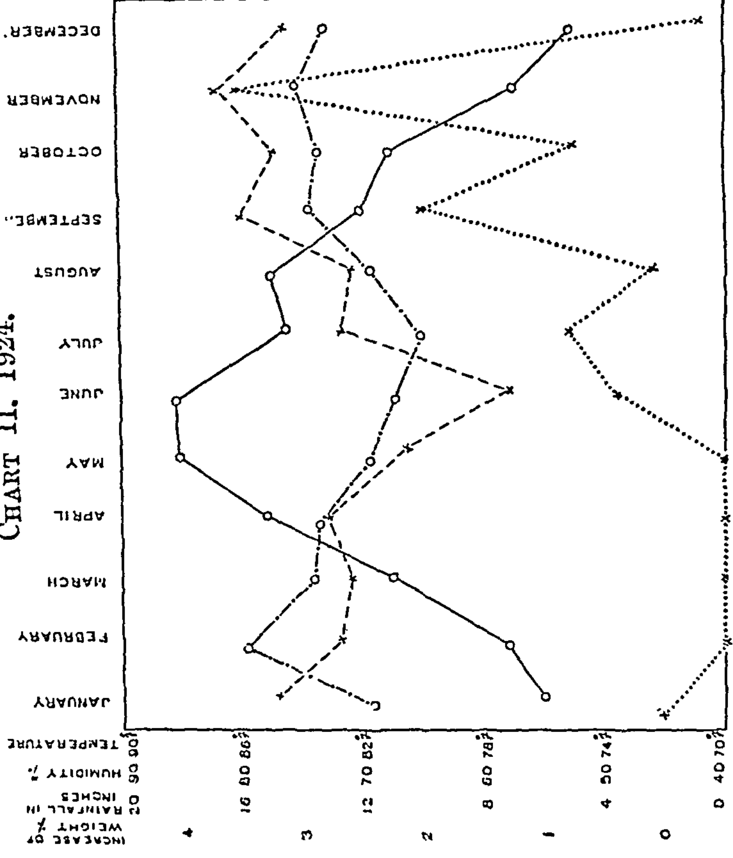


Chart II. 1924.

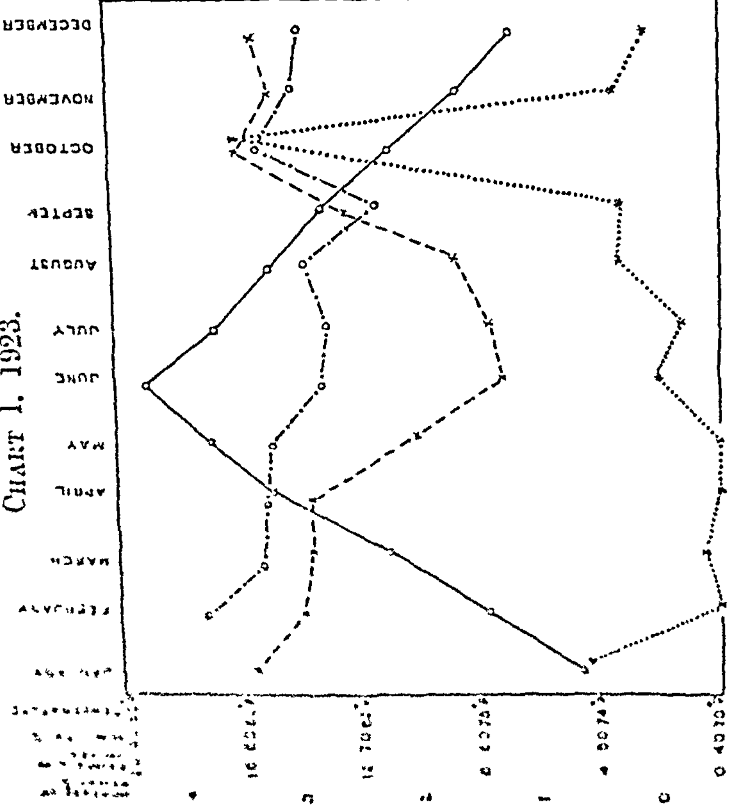


Chart I. 1923.

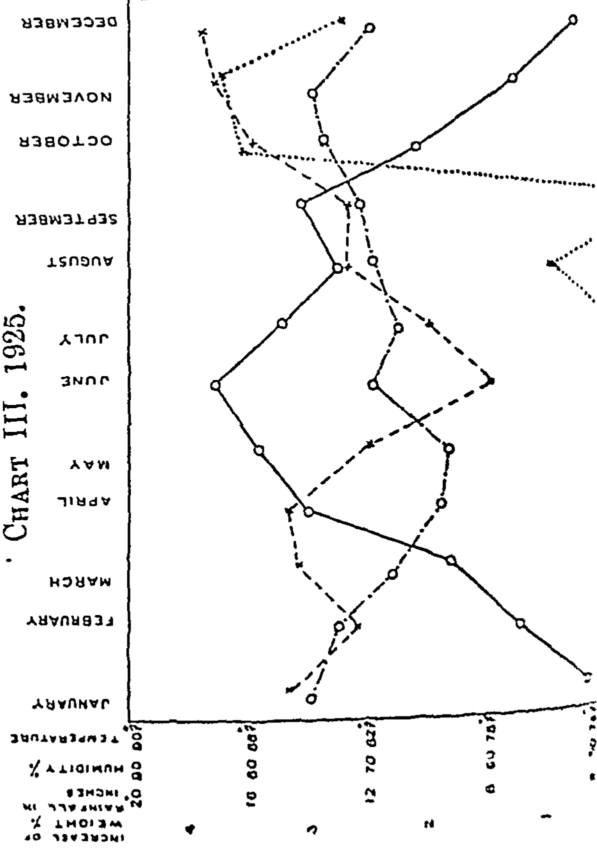


Chart III. 1925.

the signs, go hand in hand with the temperature and climate which best suit the patient These are conditions which we wish we could always provide for our patients In Craigmore Sanatorium, Colerado Springs, we observed that patients were liable to set-backs at the time of year when the weather was beginning to get hot Later on, they got adjusted to the summer weather

While the body is adjusting itself to climatic changes it is reasonable to say that the patient's resistance is temporarily lowered, and therefore during such times additional care is needed

Maintenance of weight should be watched also during the period of experimental exercises, called graduated exercises, along with other signs, for my colleagues and I, in Glen Lake Sanatorium, Minnesota, observed spread of disease in some patients who were taking exercise revealed by *X* ray pictures and not apparent to trained and careful physical examination

in different countries during those parts of the year when the temperature and humidity are consistent with personal comfort and conducive to assimilation and optimum metobolic conditions.

We are grateful to the Government Meteorologist of Madras for supplying us with figures for temperature, rainfall and humidity for the period covering the above observations.

REFERENCES.

(1) LUNDE, N. (1925) .. .. The effect of the seasons on the general condition and increase in weight of the tuberculous patients. *Tubercle*, April, p. 323.

(2) FRIMODT-MÖLLER, C. (1921) .. Climate and weight of tuberculous patients in South India. *Ibid.*, p. 385.

DISCUSSION.

Dr. C. Frimodt-Möller (Madras): It would have been of great interest to have had a weekly record of the weighing of the patients in Madras, as it is the weekly influence of the climate which is most striking. It has been found at Arogyavaram near Madanappalle, as in Europe, that heavy rain brings about an immediate loss in weight during the following week, while this decrease is usually followed by a marked increase during the next few weeks. It is for many reasons well to know that in certain weeks practically all the patients lose in weight on account of the influence of the weather. Some moisture in the air is necessary for the gain in weight, while it has been shown in England that strong rain-bearing winds have a detrimental effect on the gain in weight. That extreme heat is equally detrimental is shown at Arogyavaram since we have about 30 per cent of the patients confined to bed with fever during our hottest month contrasted with only 18 per cent during the cold season. The curve for the percentage confined to bed follows exactly the curve for the maximum temperature of the air during the different months. Rest in bed has not the object of making the patients fat. In the modern treatment, we do not desire that the patients should increase more than a little above their normal weight. The chief object of keeping the patients in bed is to give the body a chance, by the rest, to receive as little toxins as possible from the tubercular foci by a minimum flow of blood through them. Increase in weight is one of the different indications that the body can now cope with the toxins and should be allowed a stronger auto-inoculation by graded exercises, as these produce more blood to flow through the foci. The increased auto-inoculation, when the body can cope with this, stimulates the defensive forces of the organism to further activities in bringing on fibrosis. In the hot season where the patients gain less in weight, more care must be taken in supporting the body in its attempt to neutralize the bad effect of the heat, and the graded exercises should be cut down.

Dr. E. R. Webb (Central Provinces): So long as a patient with tuberculosis is gaining weight, we should regard him with the shrewd suspicion that he is regaining lost weight and exercise due care that his body may have energy also to repair damaged tissues.

Dr. Kesava Pai has aptly concluded that both gain in weight and improvement in tuberculosis, of which gains in weight and its maintenance may be regarded as one of

MALIGNANCY AMONG THE FILIPINOS *

BY

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LACK of adequate information is responsible for the conclusion quite generally accepted among occidental writers that neoplasms are comparatively rare in tropical and far eastern countries

Studies on tumors must necessarily go slow because painless growths do not usually drive patients to secure medical help early and sanitary workers give more attention to infectious and communicable diseases that may flare up in epidemics and cause massive deaths than to non communicable insiduous but equally fatal disease The need of elaborate technical procedures for the diagnosis and treatment of tumors has naturally limited the interest on these growths to pathologists and surgeons located in centres where suitable medical facilities are available

Interest in tumors in the Philippines is proceeding along the same way Comparatively speaking the problem has been very little touched upon The unreliability of statistical information from the provincial districts makes it impossible to undertake a satisfactory survey on tumor incidence and mortality over extensive areas One will be forced to resort to the undesirable method of calculating probabilities from the scant data available

It is in the hope of being able to supply additional data concerning tumors in the tropics that the present study is undertaken

From the few publications dealing with Philippine tumors all the evidence tends to show that there is no difference in the general behaviour of tumors found in Filipinos from those found in western countries Thus, Guazon(1), studying cancer cases admitted and treated in the surgical clinics of the Philippine General Hospital from March 6, 1915 to December 31, 1921, found that the majority of cancerous growths occurred between 40 and 50 years of age and the frequency of cancers in certain organs, like the breast, uterus, and stomach was in no way different from those reported by others After analysing 8,960 necropsies

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CANCER DIAGNOSIS BY THE SO-CALLED 'URINE DIAGNOSIS.'

BY

PROF. DR. M. KIUTSI

(Institute for Urobiology in Hakodate, Hokkaido, Japan).

'URINE DIAGNOSIS' was for the first time made public in my pamphlet, entitled 'Kiutsi's Urine Diagnosis by means of the Filtration Process,' published in June 1914.

Urine Diagnosis means that, we can make all diagnosis of all kinds of diseases, impregnation, the sex of the fœtus, as well as the kinds of foods taken by a person.

As I published in my so-called Urine Diagnosis at the Sixth Congress of the Far Eastern Association of Tropical Medicine at Tokyo in the year of 1925, I have explained the principle and demonstrated the reaction and the apparatus, the 'Fermentfilter.'

The principle comes from my cellular enzymatology. The isolation of the 'Minusferments' from mine can be made by a fermentfilter. This filter has the characteristic properties of letting only the minusferments pass and not the amino-acids, etc. It was simply made by me of a bamboo-stem.

The method by means of the fermentfilter is ideal for the optimal pH, but it requires time for the test to be made. My research has gone as far as the new practical method without a fermentfilter.

The test of the Urine Diagnosis for cancer can be given as follows :—

Take 20 c.cs. of the urine to be examined in a test tube, boil it one minute, pour in a beaker and add about 0·5 grm. blood charcoal to it, and then stir up with a glass stick at intervals, then pour all through a filter paper into a test tube, and add a little portion of tartaric acid, viz., 0·01 to 0·02 grm. At last put 0·01 grm. of the stained, dried substratum of cancer tumour, i.e., chromocancerin into the test tube and let it stand in an even room temperature, without being shaken. The substratum floats on the surface of the liquid in the test tube. If the liquid shows a slight red colour on the upper part within 30 minutes, the result is positive, namely, the patient has a cancer. Otherwise the liquid shows no colour.

Practical examples. During the past year, 300 diagnoses were made by myself in Kiutsi's Institute for Urobiology in Hakodate, of which 91 per cent were reliable. The source of small error may be due either to the examiner, who sometimes mingles and mistakes the urine under examination, or to the expediter, who disinfects the urine, which latter renders inactive the minusferments.

Cancer reaction by this urine method is applicable to the diagnosis of the several forms of cancers, which grow in several parts of the body.

which, together with the mammary glands registered a total of 372 or 24 76 per cent Of these, only 44 cases belong to male subjects The urinary system registered 25 cases or 1 66 per cent the brain only 8 cases or 0 53 per cent and the pulmonary system 2 cases or 0 13 per cent

The greatest regional incidence of the sarcomata was encountered in the lower extremities totalling 54 cases This number represents almost two thirds of all the malignant tumors affecting this region and more than three times the number of sarcomata of the upper extremity the latter giving only 17 cases The mesenteric structures registered 29 cases the neck 20 and the jaws 19 The other regions gave a comparatively low incidence of sarcomata

The distribution of these different malignant growths in the two sexes is given in Table III This table shows that the incidence of maligancy among the male subjects is slightly less than that of the female This is also true with carcinomata for which the ratio is 1 25 for female to 1 for male For sarcomata however the incidence in the males is almost twice that in the female

TABLE III

Showing sex distribution of 1,409 cases of malignant tumors

Sex	Carcinoma	Sarcoma	Miscellaneous	TOTAL
Males	561	127	22	706
Females	705	73	15	793

It is interesting to note however that if the malignant tumors affecting the generative organs together with their accessory glands are deducted from the above data the results as are shown in Table IV would reverse these ratios entirely and

TABLE IV

Showing sex incidence of malignant tumors after deducting those affecting the generative organs

Sex	Carcinomata	Sarcomata	Miscellaneous	TOTAL
Males	527	110	22	659
Females	380	69	14	463

give the ratio 1 5 for males to 1 0 for females both in the total and in either carcinomata or sarcomata items These latter ratios should have probably been the more natural proportions had it not been for the fact that the generative organs were so much subjected to periodic functional changes

TABLE II—*contd.*

Regions or Organs.	Carcinomata.		Sarcomata.	Miscel-laneous.	Total.	Per cent.
	Gland-cell.	Epithelioma.				
Paranasal sinuses ..	8	0	2	0	10	0·66
Penis	0	29	0	0	29	1·26
Prostate, testes ..	6	2	7	0	15	0·99
Salivary glands ..	23	0	2	1	26	1·73
Stomach	144	0	1	0	145	9·65
Thorax	11	2	8	0	21	1·39
Thyroid	23	0	0	0	23	1·59
Tongue, palate ..	14	67	1	0	82	5·47
Tonsil	7	5	0	0	12	0·79
Uterus, cervix ..	183	0	0	2	185	12·31
Vagina, vulva ..	3	3	1	0	7	0·46

From the above it can be seen that the regions and organs most frequently affected with malignant growths are the uterus 12·31 per cent, the neck 9·78 per cent, the stomach 9·65 per cent, the breast 9·12 per cent, the cheek 9·12 per cent, the liver 6·32 per cent, tongue 5·47 per cent, lower extremity 4·66 per cent, jaw 4·19 per cent.

The epitheliomata are found to occur mostly in the regions of the face and mouth. The cases occurring in these regions altogether constitute 83 per cent of the total epitheliomata found. The penis is found to be a comparatively frequent site of epitheliomata giving 7·67 per cent of the total epitheliomata incidence.

The total number of epitheliomata found in the face regions is 314. In this the cheek leads with 126 cases, the tongue next with 67 cases and the jaw third with 35 cases.

The preponderance of cheek and oral epitheliomata has been usually ascribed to the practice of 'buyo' chewing in the tropics by the natives. In this series, out of 137 patients with cheek and oral epitheliomata, 82 had the habit of chewing 'buyo' making 59·85 per cent. For the last ten years this habit of chewing 'buyo' was fast disappearing and it will probably ultimately disappear or will be very greatly diminished in another decade. If the majority of these cheek epitheliomata are secondary or due to this habit, they should be found greatly diminished in the future.

Considered by systems, the gastro-intestinal tract with its accessory organs registered the greatest number of malignant growths, totalling 450 cases, making a percentage incidence of 29·96 per cent. Secondly, are the generative organs.

The sarcomata, however, start moderately high in the first ten years, rapidly reaches a maximum of 3 per cent in the third decade and then very gradually drop down in the eighth

The miscellaneous tumors are more or less evenly distributed in the first seven decades, never rising higher than 0 53 per cent in any single age group

It would be interesting to find out in this series at which decade of life each of the most important regions or organs have become the most frequent sites of malignant new growths This information is summarized in Table VII According to this, in those organs, like the breast, uterus, stomach and liver, which are frequently affected with carcinomatous growths, the involvement started in the majority of cases in the third decade and at the earliest in the second Nearly all of these organs had the largest incidence in the fifth decade with the exception of the liver and stomach which have this maximum earlier in the fourth

TABLE VII

Showing organ incidence of malignant tumors by age groups

Organs or Regions	Decades									
	1-10	11 20	21 30	31 40	41 50	51 60	61 70	71 80	81 90	Total
Brain	1	2	4	0	1	0	0	0	0	8
Breast	0	0	8	38	54	23	7	2	1	137
Cheek	0	1	7	19	40	37	19	7	2	132
Colon	0	1	9	13	6	4	2	0	0	35
Extremity, lower	1	16	10	10	8	13	7	0	1	66
Extremity, upper	1	2	5	5	4	4	4	0	0	25
Eye	7	4	1	9	4	2	1	0	0	28
Jaw	3	1	7	10	14	11	7	3	1	57
Kidney and urinary bladder	2	0	3	4	7	2	5	1	0	24
Liver	0	8	10	29	22	15	9	1	0	94
Lung	0	0	0	0	0	1	1	0	0	2
Mesentery	1	3	10	4	5	5	0	0	0	28
Mouth	0	1	1	3	6	13	4	1	0	29
Neck	4	6	10	21	39	38	17	4	0	139
Penis	0	0	5	6	8	5	1	1	0	26
Stomach	0	0	14	40	39	33	13	2	0	141
Thyroid	0	0	4	6	3	7	1	0	0	21
Tongue	0	4	4	13	16	30	8	1	2	78
Uterus etc	1	1	19	64	64	28	4	3	0	184

It is to be noted that in the organs, like the eyes, extremities, brain, mesenteric structures, which are prone to sarcomatous growths, the involvement begins at the first ten years and has the maximum as early as the second or the third decade Where the organs are subject to the two varieties of tumor growths, there is shown an early high incidence in the second or the third decades for sarcoma and, later, much higher increase in incidence in the fourth or fifth decade for the carcinoma This can be seen in Table VII under eye and jaw It is likewise to be

The foregoing observation led me to look into the distribution of malignant tumors in the different social conditions of the 1,325 cases in which these data were available. This information is given in Table V which shows that more than half of malignant tumors occur in married life.

TABLE V.

Showing distribution of malignant growths in the different social conditions of 1,325 cases.

Tumors.	Single.	Married.	Widowed.
Carcinoma ..	115	741	276
Sarcoma ..	47	91	23
Miscellaneous ..	11	18	3
TOTAL ..	173	850	302
PERCENTAGE ..	13·10	64·11	22·79

The relation of these tumors to age is shown in Table VI which gives the heaviest incidence in the fifth decade, the fourth decade coming second and the third a close third. Altogether the number of cases registered in these three decades gives a percentage incidence of 70·77. The fifth decade alone shows 27 per cent incidence.

TABLE VI.

Showing distribution of 1,502 tumors in the different age groups.

Age Groups.	1–10.	11–20.	21–30.	31–40.	41–50.	51–60.	61–70.	71–80.	81–90.	Unclassed.	Total
Carcinoma ..	2	24	122	301	378	276	116	35	10	..	1,26
Sarcoma ..	12	31	46	42	22	27	12	2	0	..	19
Miscellaneous	7	2	8	7	6	4	0	0	1	6	4
TOTAL ..	21	60	176	350	406	307	128	37	11	6	1,50

Among the carcinomata, the rate of increase by age groups runs parallel to the total rate increase. It rises up suddenly from the second to the third decade and by large increments it reaches its maximum in the fifth. Then it gradually drops down in the seventh decade to rapidly diminish in the eighth.

ANÉMIE SPLÉNIQUE ET SPLÉNOMÉGALIE TROPICALE EN ANNAM.

PAR

TARDIEU,

Medecin major de 1re classe des Troupes Coloniales.

POURSUIVANT ses études sur l'action des Citrates en thérapeutique et en particulier sur leur emploi dans le traitement des anémies, le Docteur Léon Normet, actuellement Directeur du Service de Santé en Annam, a songé à utiliser cette médication dans une variété de splénomégalie, fréquemment observée dans le Centre Annam, assez habituellement accompagnée d'anémie profonde et couramment étiquetée ' splénomégalie palustre '.

Ayant eu l'occasion dans une visite à l'hôpital de Hué de constater les bons effets de cette thérapeutique(1), d'autre part, connaissant par une expérience vieille d'une quinzaine d'années, le peu d'action, sauf de rares exceptions(2), des médicaments habituels, même à doses très élevées—arsenic, quinine, fer, iode et leurs dérivés—dans le traitement de ces hypertrophies spléniques, nous avons mis en œuvre cette médication à l'Hôpital de Tourane, largement approvisionné en semblables malades. C'est le résultat de cette expérimentation que nous rapportons dans cette Communication

TECHNIQUE EXPERIMENTALE

Le traitement représentant, en quelque sorte, dans ce travail, la technique expérimentale, nous allons en indiquer les modalités dès le début

Nous nous servons de la solution suivante .—

Citrate de soude	52 gr.
Citrate de magnésie . . .	10 ,,
Tartrate ferrico-potassique . . .	3 ,,
Citrate de manganèse . . .	0 ,, 005
Eau distillée	1000 c c.

(1) Le Docteur Normet a deja signale la guerison des splenomegalies accompagnant les anemies pernicieuses, traitees par les injections intraveineuses d'une solution de citrate de soude et de tartrate ferrico potassique (Traitement de l'anémie par les injections intraveineuses de citrate de soude : *Bulletin de l'Académie de Medecine*, 27 Decembre, 1923)

(2) Le Docteur L R Montel de Saigon a signale dans un article du *Bulletin de la Société Médico-Chirurgicale de l'Indochine* (12 Septembre, 1915) les bons effets du Neosalvarsan dans le traitement de la splénomégalie palustre , cela confirme une des conclusions de notre Communication que le traitement medical de cette affection peut s'opposer victorieusement au traitement chirurgical. Aussi bien, il nous semble qu'il faille etre reservé dans l'emploi du 914 aux doses élevees indiquees par le Docteur Montel (jusqu'à 1 gr. 50 dans certains cas), avec le produit actuel tout au moins, qui nous a paru plus toxique que les preparations antérieures a 1920.

noted that when organs are subject only to the less malignant type of tumors, as the epitheliomata, the incidence in these organs, increases and decreases very gradually and they are evenly distributed in all the decades. This is shown by the mouth, tongue, cheek and jaw.

It is only natural to expect that after sixteen years of the hospital existence there should be noted an improvement in the way the patients come to seek hospital aid. This should be reflected in the shortening of the time which elapsed from the moment the patients first noted the existence of the growth to the time they were admitted in the hospital. This information is available in 1,256 cases out of 1,502 under consideration. The results are tabulated in Table VIII.

TABLE VIII.

Showing average duration in months per year of 1,256 cases of malignant growths.

Year.	1910.	1911.	1912.	1913.	1914.	1922.	1923.	1924.	1925.	1926.
Average Duration ..	15·8	13·0	16·0	22·5	18·9	14·1	15·2	18·5	25·2	16·0

In this table the average duration in months per year is obtained in the following manner :—The tumors collected in the year are multiplied by their corresponding duration in months, the results added together and then divided by the number of tumors.

It can be seen by glancing at this table that while there is a yearly irregular variation, yet these figures do not show definite information towards any one direction. However, if the average is taken for each five-year period there will be a difference of only 1·44 months between the 1910—1914 (average = 17·24) period and 1922—1926 (average = 15·80) period showing a very slight improvement.

CONCLUSION.

This study shows that tumor incidence in Filipinos is in no way much different from that of occidental countries except in the high percentage of primary carcinomata of the liver.

These findings are in harmony with those of Snidjers and Straub(3).

REFERENCES.

(1) GRAZOS, P. C. (1925) .. .. A Study of Cancer in the Philippine General Hospital. *Jour. Phil. Is. Med. Ass.*, 5, 157, June.

(2) VEDDER, E. B. (1927) .. .. The Incidence of Cancer in Filipinos. *Jour. Amer. Med. Assoc.*, 28, 1627.

(3) SNIJDERS, E. P., and STRAUB, M. (1923) Contributions to the Cancer Problems in the Tropics. *Trans. Fifth Biennial Congress, F. E. A. T. M.*, *Singapore*, p. 779.

et à aucun moment, à l'exception d'un seul malade (Dinh Ga, n° 12), chez qui nous avons noté dans le tissu splénique des gametes de la quarte, d'ailleurs extrêmement rares, nous n'avons rencontré d'hématozoaires dans la rate à l'occasion des très nombreuses ponctions de cet organe que nous avons pratiquées

Symptomatologie

L'hypertrophie splénique est naturellement la règle, mais de qualité essentiellement variable et nous avons retrouvé la même morphologie des éléments de la rate, prélevés par ponction, chez des malades dont le grand diamètre de la rate à la percussion mesurait 15 à 18 centimètres (hypertrophie moyenne), aussi bien que chez des malades dont la rate constituait une véritable tumeur abdominale, débordant l'ombilic et s'avançant même dans certains cas jusque dans l'hypocondre droit, le grand diamètre atteignant alors 10 à 45 centimètres Sur le bord antérieur se dessinent quelquefois nettement les incisures spléniques plus accusées qu'à l'état normal

L'hypertrophie entraîne tres fréquemment une ptose de l'organe, par tiraillements sur les épiploons jouant le rôle de ligaments suspenseurs, avec glissement, déplacement important du hile, ce sont des rates qui ne pourront reprendre leur position normale, qui ne pourront réintégrer la loge splénique et il y aura lieu de tenir compte de ce déplacement dans la lecture des résultats Plusieurs de nos splénomégaliques ont vu leur rate se réduire à son volume normal, alors que le pôle inférieur débordait encore les fausses côtes

La rate est le plus habituellement mobile, facilement déplaçable, quelquefois elle est projetée en avant, flottante, quelquefois encore elle est profonde, comme accolée au rein gauche, fixée par des adhérences Nous avons observé deux cas de périviscérite avec rate très douloureuse, obligeant l'un des malades à passer des heures ' courbé en deux ' et nécessitant pour tous les deux l'emploi d'injections de morphine.

L'hypertrophie hépatique a été notée chez six de nos malades, sur les quinze dont nous rapportons l'observation Le foie débordait de deux à quatre travers de doigts les fausses côtes, l'augmentation de volume portant aussi bien sur le lobe droit que sur le lobe gauche, dont le bord inférieur venait chez deux de nos malades (n^os^ 3 et 10) en contact presqu'immédiat avec le bord antérieur de la rate

Les malades présentent quelquefois (3 15) une teinte subictérique des muqueuses et des téguments, avec présence de pigments biliaires dans l'urine, persistant assez longtemps même après qu'une amélioration très nette de tous les autres symptômes s'est manifestée.

L'hypertrophie spléno hépatique entraîne parfois (1/15) par congestion du système porte des troubles circulatoires, qui se manifestent par des œdèmes des membres inférieurs, une légère ascite, avec retentissement sur le cœur droit (trois cas de dilatation du ventricule droit, avec chez un malade un souffle d'anémie à l'orifice pulmonaire) sans lésions orificielles cependant.

Nous désignerons cette formule sous le nom de Citrase donné par le Docteur Normet, pour la distinguer d'autres formules à base de citrate de soude, qui ont des indications et des appellations différentes.

Chaque malade pesé reçoit dans la veine une injection de Citrase à la dose de un huitième de c. c. par kg., chaque jour, pendant douze jours consécutifs.

Chaque série de 12 injections est séparée de la suivante par un repos de 15 jours. Le nombre des séries n'est pas limité ; nous arrêtons le traitement, lorsque nous avons obtenu la guérison. Certains malades ont reçu jusqu'à vingt séries dans l'espace d'un an.

Signalons que l'action de la Citrase s'exerce pendant longtemps après le traitement, le médicament provoquant, comme nous le verrons plus loin, une réaction myéloïde de la rate, qui, une fois déclanchée, continue à porter ses fruits.

Les malades que nous avons soignés à Tourane ont eu un premier traitement témoin par la quinine, qu'ils aient ou non présenté des hématozoaires à leur arrivée, traitement qui a eu un résultat spécifique chez les paludéens en état d'infection, mais qui n'a pas eu d'action sur le volume de la rate, pas plus que sur le taux de l'anémie. Au contraire, les deux malades traités à Hué, qui font partie de notre statistique et qui n'ont présenté aucune manifestation palustre n'ont pas eu d'autre traitement que par la Citrase.

Les splénomégalies que nous avons observées et traitées sont très nombreuses dans la clientèle hospitalière de Tourane, où nous recevons des malades tant de la Concession française que de la province de Quang-nam et de la province de Thua-thien. Ces mêmes malades se retrouvent à l'Hôpital Principal de Hué, où fréquente toute la population du Centre Annam.

Sans vouloir porter un jugement à priori, il est très vraisemblable de penser que la majorité des splénomégalies de l'Annam et de l'Indochine toute entière, dénommées couramment splénomégalies palustres, se rattachent au type que nous essayons de définir.

Étiologie.

Beaucoup de nos malades appartiennent à des régions très impaludées et il n'est pas douteux qu'il existe chez la plupart d'entre eux une imprégnation palustre importante. Cette imprégnation ne constituant pas cependant une règle absolue—(est-il besoin de faire remarquer, par opposition, qu'à paludisme sévère ne correspond pas inévitablement grosse rate et surtout hypertrophie définitive de cet organe !)—c'est à dessein, et pour d'autres raisons que nous allons énumérer, que nous avons abandonné l'étiquette de splénomégalie palustre pour celle de splénomégalie tropicale.

Nombreux sont nos malades qui ne rapportent dans leurs anamnestiques aucun accès palustre, assez nombreux même sont ceux qui ont vécu dans des régions à peu près exemptes de paludisme.

Il est à remarquer d'autre part que nos malades—suivis pour la plupart pendant longtemps—ne présentent des accès paludéens que dans une faible proportion (1 15)

le moindre accident. Nous nous servons à cette effet d'une aiguille de un millimètre de diamètre, que nous enfonçons, en prenant toutes les précautions aseptiques d'usage, en plein tissu splénique, a cinq ou six centimètres de profondeur ; nous recommandons simplement au malade de suspendre sa respiration pendant le temps de la ponction Une aspiration est faite à l'aide d'une seringue, exactement adaptée à l'aiguille, aspiration rapide, en un seul temps, de façon à obtenir autant que possible, un prélèvement de tissu splénique L' idéal est d'aspirer une rondelle de rate, comme découpée a l'emportepièce, de préférence à du sang qui envahirait la seringue si l'aspiration était continue)

Nous avons invariablement trouvé, avant de commencer le traitement, dans tous les cas sans exception, des éléments cellulaires a morphologie bien déterminée et dont la présence n'a jamais été signalée dans la rate normale des plasmazellen et des polycaryocytes Les premiers sont caractérisés par leur noyau excentrique, leur protoplasme basophile et la plage claire qui avoisine le noyau, dont le reseau de chromatine est condensé en amas fortement chromophiles, séparees par des espaces plus clairs Certains d'entre eux présentent des granulations claires ou peut-être des vacuoles, dont la frequence a été signalée par divers auteurs et dont la nature est difficile à préciser Les seconds peuvent être définis des plasmazellen a plusieurs noyaux car ils presentent exactement la même morphologie et les mêmes affinités colorantes que les précédents, dont ils se distinguent par leur grande taille et la présence de plusieurs noyaux En particulier, des elements à deux noyaux semblent être un stade de division intermédiaire entre les polycaryocytes à quatre noyaux et les plasmazellen à noyau unique

Dans quelques cas, nous avons trouvé en outre, en assez grand nombre, des cellules de Rieder, qui dans la circonstance paraissent apparentées aux plasmazellen, dont elles ont gardé la plage protoplasmique decolorée, ainsi que le protoplasme fortement basophile, tandis que le noyau a subi une transformation trés particulière, présentant une sorte de bourgeonnement avec des renflements en massue, rattachés entre eux par de légers pédicules, se réunissant au point central de la cellule

Nous ne jugeons pas à propos de donner des résultats de formule leucocytaire, car ils sont essentiellement variables chez le même malade, d'une ponction à l'autre, étant donnée l'impossibilité ou l'on se trouve d'éviter l'introduction dans la seringue d'une petite quantité de sang circulant variable d'une ponction à l'autre et qui change complètement les résultats de la formule

Il est remarquable que le sang circulant ne traduit le travail qui se passe dans la rate que par la présence de nombreux normoblastes et de quelques érythroblastes en mitose (voir la Communication du Docteur Normet à l'Académie de Médecine, citée plus haut).

Il serait intéressant de rechercher ces éléments anormaux dans toutes les splénomégalies, car il paraît vraisemblable que la présence des plasmazellen et

L'anémie est sévère dans la majorité des cas ; un de nos malades avait moins d'un million de globules rouges, sept moins de deux millions ; elle est quelquefois peu importante (trois de nos malades avaient à l'entrée entre 3.000.000 et 3.500.000 globules rouges). Le taux de l'hémoglobine est également très diminué, mais dans des proportions moindres que le taux des globules rouges, d'où pour la plus grande partie des malades une augmentation de la valeur globulaire (2,22 dans un cas).

On note chez les femmes des troubles dysménorrhéiques avec aménorrhée totale dans un cas ; la fonction menstruelle reprend sa norme au cours du traitement.

Le rein semble respecté ; nous n'avons enregistré aucun trouble néphrétique important. Un seul malade a présenté passagèrement cinquante centigrammes d'albumine par litre. L'urée sanguine a été trouvée augmentée dans quatre cas, normale pour tous les autres malades.

L'état général est médiocre ou mauvais, avec amaigrissement, fonte musculaire parfois, téguments terreux, parcheminés. Nombre de nos malades étaient des invalides, des infirmes pour quelques-uns, qui 'portaient' difficilement leur tumeur splénique.

Les jeunes gens paraissent présenter un arrêt de développement, qui donne à des adolescents le type infantile (*cf.* Article de Montel, dans le *Bulletin de la Société de Pathologie Exotique :* 'Infantilisme palustre,' Octobre 1918).

Il est bien entendu que la maladie que nous venons de décrire nous paraît se distinguer nettement de la maladie de Banti (peu ou pas de troubles digestifs, pas d'hématémèse, pas d'atrophie cirrhotique du foie, pas d'ascite importante), de la syphilis splénique (pas de commémoratifs de syphilis acquise, pas de stigmates d'hérédo-syphilis : kératite, surdité, dent d'Hutchinson, rédaction de Wassermann positive dans 6,15 des cas, ce qui est à peu près la proportion trouvée chez les Annamites pris au hasard, pas d'hématémèse, pas de purpura) et de la splénomégalie tuberculeuse (pas de tuberculose des autres organes, pas de fièvre oscillante, pas de polynucléose). Nous dirons enfin, pour mémoire, que nous n'avons rencontré chez aucun de nos malades de corpuscules de Leishman-Donovani, dans le sang circulant, ni dans la rate.

Anatomie-pathologique.

L'anatomie-pathologique complète de l'affection n'a pu être faite, tous les malades que nous avons traités étant guéris ou ayant évolué vers la guérison ; nous n'avons pas eu de décès. Cependant toutes les nombreuses ponctions de rate, pratiquées avant et pendant le traitement et après la guérison, nous ont permis de faire des constatations très intéressantes sur la présence dans cet organe d'éléments anormaux que nous allons succinctement décrire.

(Mentionnons entre parenthèses l'innocuité absolue des ponctions de rate chez tous nos malades. En dépit de l'opinion courante, qui veut que la ponction des grosses rates soit dangereuse, même sous d'infinies précautions, nous avons ponctionné à différentes reprises tous nos splénomégaliques, sans jamais noter

A sa sortie de l'Hôpital, les deux diamètres de sa rate sont de 16 et 6 centimètres (à noter le glissement du hile, qui ne permettra pas à l'organe ptosé de reprendre sa place dans la loge splénique). Le nombre de globules rouges est de 6.200.000 ; le taux de l'hémoglobine de 85 pour cent. Le poids est de 29 kg. 200.

Pour l'ensemble des malades traités, le tableau ci-joint indique :

(1) les résultats des numérations globulaires, du taux de l'hémoglobine, la valeur globulaire avant le traitement et à la fin du traitement ;

(2) le nombre de mois écoulés entre l'admission à l'Hôpital et la guérison ou l'amélioration, pour les malades qui sont en cours de traitement ;

(3) les dimensions du diamètre longitudinal et du diamètre transversal de la rate, au début et à la fin du traitement.

Aussi bien, les quelques photographies que nous joignons à cette étude donneront mieux que toute description une idée des résultats très satisfaisants qu'il est permis d'obtenir de cette méthode.

Numeros	Noms des malades	Duree du traitement	Nombre de globules rouges		Taux d'hemoglobine		Valeur globulaire		Diametre de la rate			
									D. longitudinal		D. transversal	
			avant traitement	après traitement	avant traitement	après traitement	avant traitement	après traitement	avant	après	avant	après
					Pour cent.	Pour cent.						
1	Trân-thi-Thom	2 mois	2.500.000	3.866.000	45	75	0 90	0 97	25	12	15	5
2	Nguyên-Chit ..	8 mois	1.120.000	6.200.000	20	85	0 89	0 68	40	16	20	6
3	Tam-thi-Ky ..	2 mois	2.724.000	3.441.000	60	70	1 10	1 01.	24	16	11	6
4	Duong-Thân ..	4 mois	3.410.000	4.681.000	60	80	0 87	0 85	20	12	12	[illegible]
5	Truong-Han ..	1 mois	3.531.000	3.596.000	70	75	0 99	1 04	22	15	15	[illegible]
6	Do-Nghi ..	45 jours	3.007.000	3.410.000	55	60	0 91	0 87	25	17	10	6
7	Nguyên-Hung	2 mois	1.147.000	3.410.000	25	75	1 08	1 09	16	12	9	[illegible]
8	Lê-van-Hoa ..	3 mois	1.705.000	3.038.000	35	60	1 17	0 98	18	12	9	5
9	Trân-huu-The	1 mois	0.890.000	3.007.000	10	80	2 22	1 33	22	12	10	7
10	Dang-thi-Nghe?	3 m. 15 j.	1.829.000	3.751.000	50	85	1 36	1 13	26	12	17	[illegible]
11	Trân-Tu? ..	3 m. 15 j.	1.953.000	3.410.000	50	75	1 28	1 09	20	12	16	[illegible]
12	Dinh-Ga? ..	4 mois	1.612.000	2.720.000	60	70	1 86	0 99	27	16	16	[illegible]
13	Ho-Tinh? ..	15 jours	2.721.000	5.230.000	50	80	0 91	0 76	27	17	16	[illegible]
14	Phan? ..	11 mois	1.120.000	5.100.000	20	90	0 89	0 88	40	16	[illegible]	[illegible]
15	[illegible] ..	8 mois	2.160.000	4.560.000	50	70	1 15	0 87	40	20	25	[illegible]

praticiens a eu comme point de départ l'impotence créée par le volume de la rate, qui rend invalides de nombreux splenomégaliques

Chez deux de nos malades, qui présentaient de la périsplénite douloureuse, la rate s'est peu à peu libérée de ses adhérences, est devenue mobilisable et a régressé, cependant que les douleurs disparaissaient Notons qu'un traitement quinique actif, dans les deux cas, n'avait apporté aucune modification du phénomene douleur

L hypertrophie hepatique, corollaire de l'hypertrophie splenique, s'ameliore habituellement a mesure que la rate rentre dans sa loge La disparition du subictère suit la regression hépatique

L'anémie s'amelıore considérablement trois malades ont vu leur chiffre de globules rouges depasser 5 000 000, Nguyen Chit, un de nos succes les plus complets, dépassait même a sa sortie de l'Hôpital 6 000 000 de globules par millimetre cube L'ascension du taux d'hémoglobine suit l'augmentation des globules rouges sept de nos malades ont un minimum de 80 pour cent d'hemoglobine La valeur globulaire tend à se rapprocher de l'unité(1)

Les troubles circulatoires disparaissent œdèmes, ascite, réactions cardiaques

L'état général se rétablit tres vite, souvent bien avant la regression compléte de la rate et nous avons eu grand'peine a conserver nombre de nos malades, qui, pauvres gens pour la plupart, desiraient quitter l'hopital, afin de reprendre leur travail Plusieurs de nos splénomégaliques ont, en cours de traitement, augmente de cinq à six kilogs

Nous croyons inutile de donner les observations de nos malades, qui se ressemblent toutes Nous nous bornerons a citer celle de l'un d eux dont nous reproduisons d'ailleurs la photographie

Malade n 2 Nguyên Chit, 18 ans, provient de la province de Quang nam, en contre bas de la Chaîne annamitique, région assez fortement impaludee, ne signale cependant pas d'accès de fievre très fréquents dans ses antécedents a vu sa rate grossir peu à peu depuis cinq a six ans, pour devenir une formidable tumeur, projetée en avant, qui s'est fait un lit du petit bassin et a envahi l'hypocondre droit, le grand diametre mesure 40 centimètres, le diametre transverse 25 centimètres

Membres supérieurs grêles—type infantile—amaigrissement (poids 24 kilogs)

Globules rouges 1 120 000 Taux d'hémoglobine 20 pour cent

Pas d'hématozoaires dans le sang circulant, ni dans le tissu splénique à l'entree, ni a l'occasion des nombreux examens pratiqués en cours de séjour

Foie, cœur, reins normaux, uree sanguine 0 gr 20 p 1 000, uréc urinaire 16 gr par 24 heures

Le malade est resté à l'Hôpital six mois, pendant lesquels il a reçu 46 injections de Citrase

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(1) Il est bon de noter que le nombre des globules rouges avec l appareil Malassez, dont nous nous servons, chez la moyenne des sujets bien portants (Europeens compris) ne dépasse pas 4 200 000 globules rouges et que le taux d hémoglobine se fixe aux alentours de 90 per cent chez les Europeens et de 80 per cent chez les Annamites de notre region

MONTEL, M. L. R. et DANG-VAN-CUONG (1918). Paludisme et phagédénisme paludisme et arrêt de développement. Infantilisme palustre. *Bulletin de la Société de Pathologie Exotique*—Octobre 9.

NORMET, L. (1923) .. .. Traitement de l'anémie par les injections intraveineuses de citrate de soude. *Bulletin de l'Académie de Médecine*. N° 44. T. XC., Décembre 27.

Do. (1925) .. .. Les Citrates en thérapeutique. *Presse médicale*. N° 3, Janvier 10.

Do. (1926) .. .. Le Citrate de manganèse en thérapeutique. *Paris-médical*. N° 59, Juillet 31.

CONCLUSIONS.

En conclusion, nos malades sont des splénomégaliques que nous ferions volontiers entrer dans le groupe des anemies spléniques décrites par Aubertin Aucun de nos malades ne présentait en effet le chiffre normal de globules rouges, qui est en moyenne de 4 200 000 chez les bien portants, avec l'appareil de Malassez dont nous nous servons Il nous paraît infiniment probable que chez la plupart de ces malades et peut être chez tous, le point de départ de la splénomégalie doive être attribué à une infestation palustre ancienne Il est remarquable que la plupart d'entre eux n'ont jamais eu d'accès palustre et n'ont jamais présenté d'hématozoaires pendant toute la durée du traitement Il semble donc vraisemblable que l'infestation palustre mette en route l augmentation de volume de la rate et que ce mouvement une fois déclanché continue à développer ses effets même lorsque les hématozoaires ont complétement disparu. Il nous paraît rationnel d'admettre que le développement de la rate s'accompagne d'un hyperfonctionnement, qui conduit à l'anémie par l'exagération de la fonction hémolytique de l'organe Cependant chez beaucoup de malades cet hyperfonctionnement est en partie compensé par l'apparition d'une fonction hématopoiétique anormale, qui permet a la rate de former des elements de la série rouge (érythroblastes, normoblastes et hématies) C'est précisément cette fonction hématopoïétique que la Citrase a le pouvoir d'exagérer quand elle existe déjà ou de faire apparaître, si la réaction ne s'est pas produite naturellement. De telle sorte que toutes les anémies spléniques qu'il nous a été donné d'observer ont pris en cours de traitement un type se rapprochant de celui qui est signalé par Aubertin sous le nom d' 'anémie splénique myeloide' Ce phénoméne de défense s'accompagnant sous l'action de la Citrase de la diminution de volume de l'organe et concurremment, du retour à l'etat normal de la fonction hémolytique, conduit rapidement à la guérison une affection, qui, dans un grand nombre de cas, paraissait devoir aboutir à une anémie pernicieuse mortelle, ou nécessiter une intervention chirurgicale dont le pronostic reste toujours trés sombre quand il s'agit surtout de rates aussi volumineuses que celles des malades Pham et Chit dont nous donnons les photographies

INDEX BIBLIOGRAPHIQUE

AUBERTIN, CH (1925) . Le diagnostic des anemies spleniques *Presse médicale*, N° 49—Juin 20

GAIDE (1916) . . .. Paludisme et splenectomie *Bulletin de la Société médico chirurgicale de l Indochine*—Juin

HEYMANN (1925) .. .. Traitement des rates paludeennes par la radiotherapie Congres de la Far Eastern Association of Tropical Medicine Tokyo—Octobre

LE ROY DES BARRES (1925) Du traitement chirurgical des splenomégalies palustres non compliquées Congres de la Far Eastern Association of Tropical Medicine Tokyo—Octobre

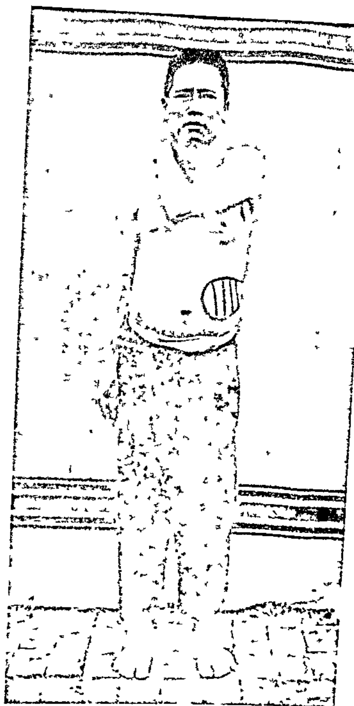
MONTEL, M L R (1925) .. . Splenomegalie, cachexie palustre et Neosalvarsan *Bulletin de la Société medico chirurgicale de l'Indochine*—Septembre 12

HO-TINH.



e | Numeration globulaire . 2 724 000
Taux d hemoglobine . 50 pour cent
Diametre de la rate. | Diam longit 27 cent
— transv. 16 cent

HO-TINH.



Malade après 45 jours de traitement | Numération globulaire . 5 230 000
Taux d hémoglobine . . 80 pour cent
Diamètre de la rate. | Diam. longit. 17 cent.
— transv. 11 cent.

PLANCHE VIII

TRAN-HUU-THE



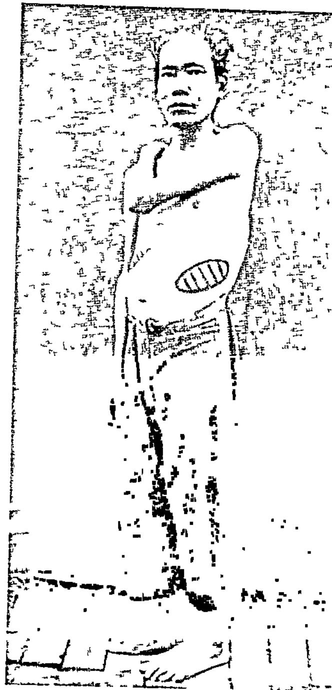
alade

entrée

Numération globulaire . 0.890 000
Taux d'hemoglobine . 40 pour cent.

Diamètre de la rate: Diam. longit. 22 cent. — transv. 10 cent

TRAN-HUU-THE



Après 4 mois de traitement

Numération globulaire 3 007.000
Taux d'hemoglobine . 80 pour c

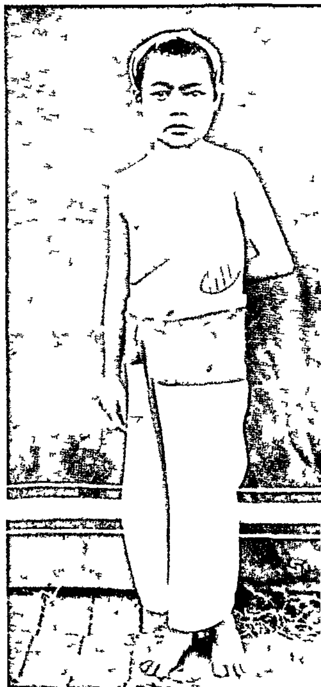
Diamètre de la rate. Diam. longit 12 cent. — transv. 5 cent.

DANG-THI-NOAO



Malade à l'entrée — Numération globulaire 1 8?9 000 ; Taux d'hémoglobine 50 pour cent ; Diamètre de la rate : Diam. longit. ?6 cent. ; — transv. 15 cent.

DANG-THI-NOAO



Malade après 3 mois et 15 jours de traitement — Numération globulaire 3 ?51 00[illegible] ; Taux d'hémoglobine 85 po[illegible] ; Diamètre de la rate : Diam. longit. 1? ce[illegible] ; — transv. 6 ce[illegible]

DINH GA



Numération globulaire 1 6[illegible]0 000
Taux d'hémoglobine 60 pour cent

Diamètre de la rate { Diam. longit. [illegible] cent / — transv. 16 cent

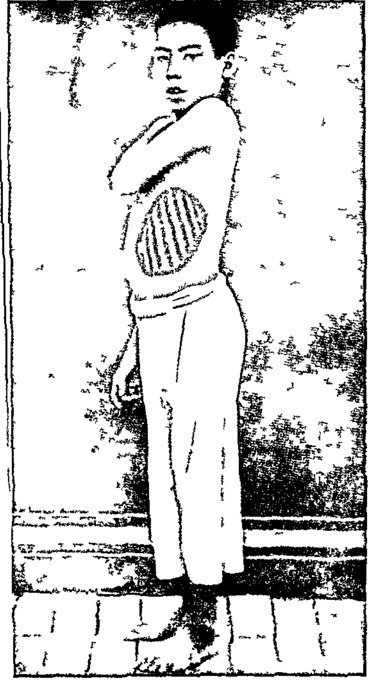
DINH GA

Malade après 4 mois de traitement { Numération globulaire 3 720 000
Taux d'hémoglobine 70 pour cent

Diamètre de la rate { Diam. longit. 1[illegible] cent / — transv. 7 cent

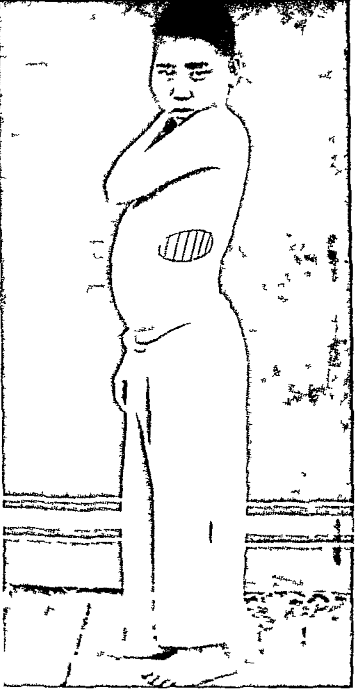
PLANCHE XI

TRAN TU



Malade à l'entrée
- Numeration globulaire: 1 953 000
- Taux d'hémoglobine: 50 pour cent
- Diamètre de la rate: Diam longit 20 cent; — transv 16 cent

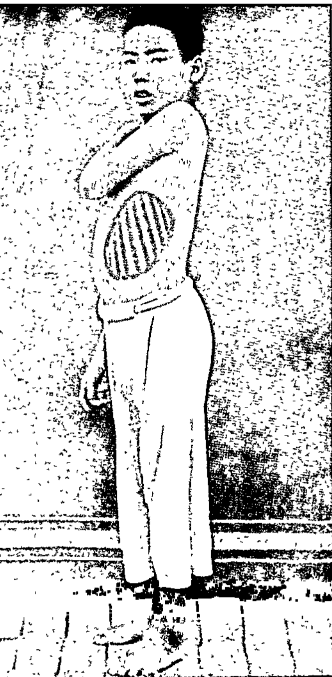
TRAN-TU



Malade après 3 mois et demi de traitement
- Numeration globulaire: 3 410 000
- Taux d'hémoglobine: 75 pour cent
- Diamètre de la rate: Diam longit. 12 cent.; — transv 5 cent

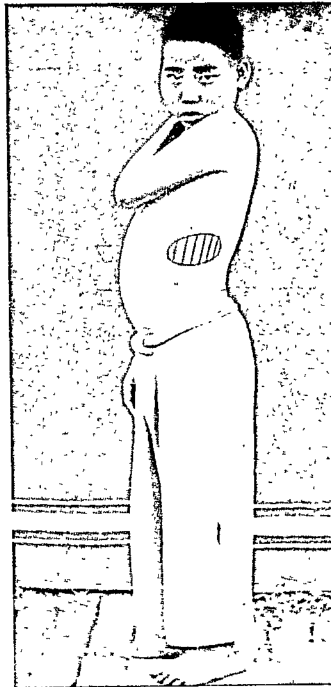
PLANCHE XI.

TRAN-TU.



lalade 'entrée — Numération globulaire . 1.953.000 ; Taux d'hémoglobine . 50 pour cent. — Diamètre de la rate. Diam. longit. 20 cent. ; — transv. 16 cent.

TRAN-TU.



Malade après 3 mois et demi de traitement — Numération globulaire . 3.410.000 ; Taux d'hémoglobine . 75 pour — Diamètre de la rate. Diam. longit. 12 cent. ; — transv. 5 cent.

PLANCHE XII.

DUONG-THUAN.



Malade à l'entrée — Numération globulaire .. 3.410.000 — Taux d'hémoglobine .. 60 pour cent. — Diamètre de la rate. { Diam longit. 20 cent. — transv. 12 cent.

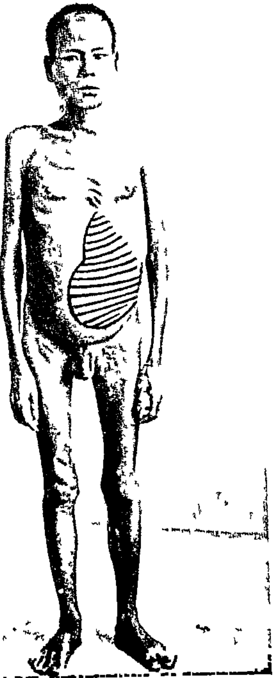
DUONG-THUAN



Malade après 4 mois de traitement — Numération globulaire .. 4.681.000 — Taux d'hémoglobine .. 80 pour cent. — Diamètre de la rate. { Diam longit. 12 cent. — transv. 4 cent.

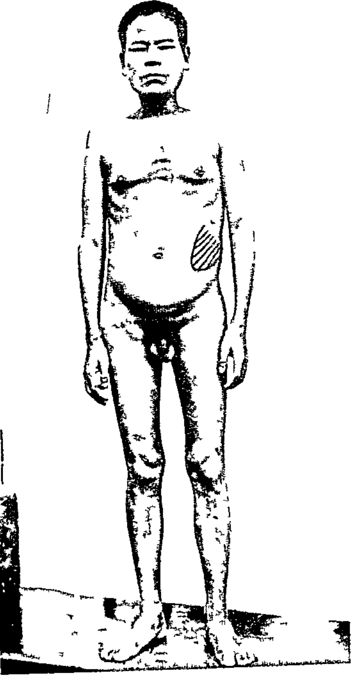
PLANCHE XIII

PHAM



Malade à l'entrée — Numération globulaire: 1 120.000; Taux d'hémoglobine: 20 pour cent; Diamètre de la rate: Diam. longit. 40 cent., — transv. 20 cent.

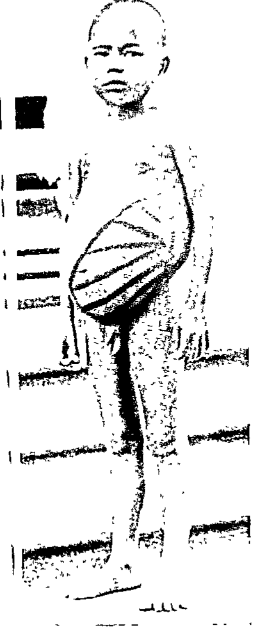
PHAM



Malade après 14 mois de traitement — Numération globulaire: 5 100 000; Taux d'hémoglobine: 90 pour cent; Diamètre de la rate: Diam. long t 16 cent, — transv. 6 cent

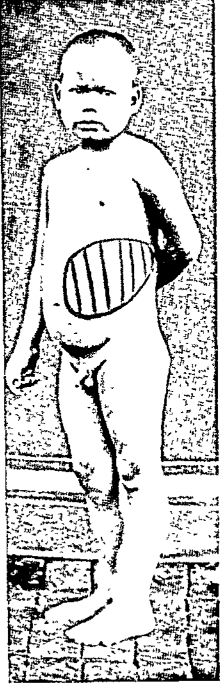
PLANCHE XIV

NGUYEN-CHIT.



Malade à l'entrée à l'Hôpital
- Numération globulaire. 1.120.000
- Taux d'hémoglobine. 20 pour cent.
- Diamètre de la rate. Diam. longit. 40 cent. Diam. transv. 20 cent.

NGUYEN-CHIT.



Malade après 1 mois de traitement
- Numération globulaire. 2.490.000
- Taux d'hémoglobine. 50 pour cent.
- Diamètre de la rate. Diam. longit. 28 cent. Diam. transv. 14 cent.

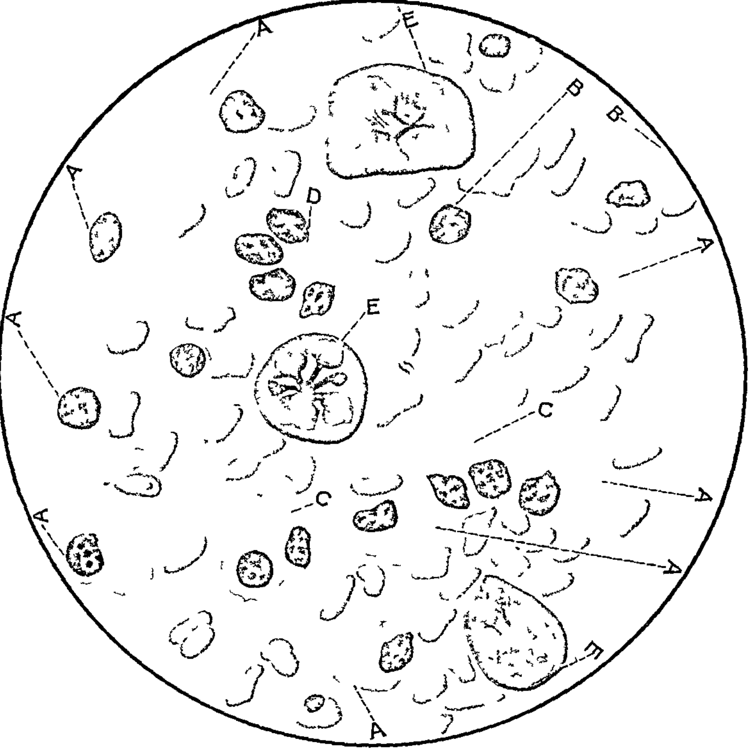
NGUYEN-CHIT.



Malade après 8 mois de traitement
- Numération globulaire. 6.200.000
- Taux d'hémoglobine 85 pour cent.
- Diamètre de la rate. Diam. longit. 16 cent. Diam. transv. 6 cent.

Planche XV

Elements anormaux de la Rate avant le traitement



A—Plasmocytes
B—Plasmocytes granuleux ou vacuolaires
C—Plasmocytes à 2 noyaux
D—Polycaryocyte
E—Cellules de Rieder

LA BOUFFISSURE D'ANNAM

PAR

LÉON NORMET

Directeur du Laboratoire d'Hygiène et de Bactériologie de Hué (Annam)

Dans une note communiquée à la Société de Pathologie Exotique de Paris le 10 Mars 1926, nous avons fait part du résultat de nos recherches sur la curieuse affection dénommée par Guillon « bouffissure d'Annam ».

A la séance de cette même société du 14 Avril 1926 Kerandel a répondu à notre communication en reprenant la thèse soutenue par certains des camarades qui nous ont précédé en Annam et qui croient devoir attribuer la bouffissure aux parasitismes multiples et plus particulièrement à la syphilis et à l'ankylostomiase (Thiroux). Nous pensons nous être insuffisamment expliqué dans notre première communication sur les trois faits nouveaux que nous versions au débat et qui à notre avis, tout en conservant aux divers parasitismes un rôle prédisposant, ne permettent pas de leur attribuer le rôle principal dans la pathogénie de la maladie. Disons tout de suite que ces trois faits nouveaux sont les suivants :

1° La bouffissure s'accompagne d'une diminution simultanée de l'urée urinaire et de l'urée sanguine ;

2° Elle est améliorée très rapidement par les injections sous-cutanées de glycocolle sans l'intervention d'aucun autre traitement.

3° Elle est susceptible de prendre une allure épidémique à la suite des grandes disettes dues aux cataclysmes naturels (typhons, inondations, etc.)

Symptômes

Rappelons tout d'abord les symptômes principaux de la maladie sur lesquels tout le monde est d'accord.

Le bouffi se présente avec un aspect très particulier : air hébété, bouche ouverte, sécheresse de la peau qui est complètement dépourvue d'enduit sébacé. Les jeunes ont souvent un aspect infantile. La croissance est arrêtée.

Les trois grands symptômes somatiques de la bouffissure sont : l'œdème, l'amaigrissement avec fonte musculaire et l'anémie.

L'œdème, dans les cas graves, réalise le tableau de l'anasarque : infiltration du tissu cellulaire surtout prononcée aux membres inférieurs et à la face, épanchement hydropique de toutes les séreuses et plus particulièrement du péritoine

fémorale qui paraissaient dus à une embolie et qui ont rétrocédé et disparu en 15 jours sous l'influence d'injections intraveineuses de citrate de soude

Il semble que la formation de caillots intracardiaques et l'embolie consécutive soient un des mécanismes habituels de la mort subite dans la bouffissure

La réaction de Wassermann est souvent positive dans la bouffissure Nos chiffres sont cependant differents de ceux obtenus par Kerandel et Thiroux.

95 pour cent d'après Thiroux,

83 „ d'apres Kerandel,

58 „ d'apres nous

Au Laboratoire de Hué, les Wassermann pratiqués dans les divers services, celui des vénériens exclu, donnent 45 pour cent de résultats positifs

Le nombre des Wassermann positifs chez les bouffis serait donc à peine supérieur à celui des autres malades pris au hasard dans les services hospitaliers

D'autre part, nous avons pu revoir un certain nombre de bouffis guéris, plusieurs mois apres leur sortie de l'hopital Sur onze de ces malades qui avaient un Wassermann positif pendant leur maladie, six presentaient, apres guérison, une réaction négative, sans qu'ils aient reçu aucun traitement specifique contre la syphilis

Pour l'interprétation de ces faits, il ne faut pas perdre de vue que la spécificité de la réaction de Wassermann par rapport à la syphilis n est pas absolue Il n'y a rien de surprenant à ce qu'une affection qui amene des changements profonds des humeurs, et en particulier du sang, comme la bouffissure, s'accompagne parfois d'une réaction de Wassermann positive sans que la syphilis congénitale ou acquise puisse être mise en cause

Les troubles digestifs caractérisés par la diarrhee et l'anorexie sont la regle au cours de la maladie

La diarrhée devient profuse à la période terminale et emporte souvent le malade, en même temps que les œdèmes disparaissent Dans d'autres cas, elle s'arrête brusquement et le malade meurt apres une période de coma qui peut se prolonger pendant deux ou trois jours

Anatomie Pathologique

Nous disions dans notre première communication citée plus haut que l'anatomie pathologique était à peu pres négative En effet, nous n'avions constaté à l'autopsie des nombreux malades morts dans les premiers mois de notre séjour à Hué, que la pâleur des organes et la présence de liquide dans les séreuses, en rapport avec l'anemie et les œdèmes La seule constatation intéressante avait été la présence d'un caillot fibrineux dans le cœur droit ayant entraîné la mort subite par syncope cardiaque.

Nous avons pense à confier la vérification des lésions anatomo pathologiques à l'excellent histologiste qu'est notre camarade Bablet des In Pas d'Indochine.

Le tissu adipeux sous-cutané est absent.

La fonte musculaire est toujours importante. Bien qu'en partie masquée par les œdèmes, elle est très apparente aux épaules, aux membres supérieurs et au thorax. Après la disparition des œdèmes, le malade prend un aspect squelettique, comme on peut le constater sur les photographies jointes à ce travail.

L'anémie est toujours très marquée. Les conjonctives et la langue sont complètement décolorées dans les cas graves. La numération globulaire et le dosage de l'hémoglobine nous ont donné chez un de nos malades (Dinh, dont nous présentons la photographie) 282.500 globules rouges et 10 pour cent d'hémoglobine.

Ces taux extrêmement bas sont en rapport avec un véritable œdème du sang. Dès que les œdèmes disparaissent, le nombre des globules rouges et le taux d'hémoglobine se relèvent pour atteindre les environs d'un million de globules rouges avec 20 pour cent d'hémoglobine.

La tension artérielle est abaissée. La maxima peut tomber à 8 chez les hommes, à 6 chez les femmes(1).

L'analyse d'urine révèle une diminution des chlorures et de l'urée, le taux de celle-ci pouvant être inférieur à 3 gr. dans les 24 heures.

A ces symptômes sur lesquels l'attention avait déjà été attirée par les auteurs qui se sont occupés avant nous de la ' bouffissure d'Annam,' nous avons ajouté la diminution de l'urée sanguine qui n'avait pas encore été signalée. Celle-ci peut tomber à 10 centigrammes par litre, elle est en tout cas inférieure à 30 (sauf quelques rares exceptions dont nous parlerons plus loin). Ce signe est capital car il est le seul qui permette de porter à coup sûr le diagnostic de bouffissure. Quelle que soit la connaissance que l'on ait de cette affection, on peut la confondre avec la néphrite si le dosage d'urée sanguine ne vient fixer le diagnostic et il nous arrive encore fréquemment d'être indécis.

Les rechéerches d'ure sanguine ne sont pas signalées dans les registres de la Pharmacie de Hué avant le mois d'août 1922. Je suppose donc que cet élément d'appréciation a manqué à Thiroux et à Kerandel et de ce fait ces auteurs ont pu faire entrer accidentellement dans le cadre de la bouffissure des néphrites s'accompagnant d'anémie et d'amaigrissement.

La viscosité sanguine est généralement normale, elle est quelquefois légèrement diminuée. Le temps de coagulation est le plus souvent augmenté.

Cependant les bouffis paraissent avoir une tendance à former des caillots à l'intérieur des vaisseaux ou dans le cœur. Nous avons cité dans notre précédente communication le cas d'un de nos malades qui présentait pendant la vie un souffle de rétrécissement pulmonaire. A l'autopsie de ce malade, mort subitement, nous avons trouvé dans le cœur droit plusieurs caillots fibrineux blancs, de constitution déjà ancienne, dont l'un était engagé dans l'orifice pulmonaire. Depuis lors un autre malade a présenté brusquement des signes d'endartérite de la

(1) La [illegible] maxima moyenne chez les Annamites de nos régions est de 11 [illegible] 10, [illegible] les femmes.

par les travaux de Schiff, V Pachon, J P Cachet Son role d'organe de reserve de matieres proteiques et de nucleo proteides a ete determine par J Jolly Enfin, Delaunay, H Serege, M Loeper, J E Decourt et A Lesure ont mis en lumiere son activite proteolytique et aminoacidogene (Leon Binet, *Presse medicale* du 13 Octobre, 1926, page 82)

L insuffisance de la rate vient donc compliquer et aggraver celle de la glande digestive pancreatique, l'activite de la premiere paraissant capable de stimuler celle de la seconde ou le cas échéant de suppleer a une insuffisance passagere de la digestion tryptique par la mise en liberte des acides amines mis en reserve dans le parenchyme splenique

La deficience de la digestion tryptique liee a l hypoplasie des glandes digestives parait donc constituer le fait capital dans la pathogenie de l affection ainsi que nous l avions prevu dans notre premiere communication La lesion anatomopathologique est a notre avis le resultat tardif d une carence alimentaire azotee speciale a la region ou sevit la bouffissure

Etiologie

Les donnees etiologiques viennent confirmer cette hypothese

Nous disions dans notre premiere communication que les bouffis d Annam appartenaient exclusivement a la classe des cultivateurs et coolies Kerandel sur 51 cas cite 48 individus appartenant à cette categorie et 3 individus qui par leur profession semblent etre à l'abri de la carence azotee une commerçante (nous ne savons pas si elle est aisee), un pecheur et un milicien Le milicien est porte au ableau statistique avec un taux d hemoglobine de 70 pour cent qui nous parait xclure le diagnostic de bouffissure En l absence de tous renseignements sur les taux 'uree sanguine il nous parait possible que certains diagnostics de Kerandel ne se esentent pas avec toute la certitude voulue Le fait qu'un des malades portes a sa atistique presente 80 pour cent d hemoglobine tendrait à nous faire croire que nous vons pas la meme definition de la maladie En effet, si l'on ne considere pas emie comme un des symptomes essentiels de l'affection et si l'on denomme ffis tous les porteurs d'œdemes dont le diagnostic est en suspens, il n y a plus de n de faire de la bouffissure une entite morbide et elle ne merite plus que d etre déree comme un symptome plus ou moins banal

Quoiqu'il en soit, nous ne pouvons que maintenir ce que nous disions tout d, que la bouffissure ne se rencontre que chez les cultivateurs et les coolies deux ans et demi, nous ne l'avons jamais observee chez les citadins aises, les ns, les fonctionnaires ni les pecheurs du bord de la mer Ces derniers nt à la maladie meme en cas de grande disette En effet, ils ont toujours a position, en dehors du poisson qui est quelquefois rare les innombrables es et crustaces qu'il est facile de se procurer par tous les temps au bord de des lagunes

us a paru intéressant de compléter nos reseignements personnels par une ans les milieux indigenes Cette enquete a ete faite par les Residents,

Malheureusement nous ne nous sommes adressé à Bablet qu'après avoir institué le traitement par le glycocolle et à un moment où la mortalité était de ce fait très diminuée, au point d'atteindre à peine deux pour cent des cas traités. Bablet n'a pu disposer que des organes de nos trois derniers décédés. Dans deux cas, il s'agissait de bouffissure compliquée (cancer du pylore une fois et tuberculose péritonéale une fois) ; un seul cas pouvant être considéré comme bouffissure pure.

Voici les résultats communiqués par Bablet :

LÊ-THÊ. 12 ans, bouffissure pure.

Rate.—Formée de tissu réticulé très lâche, rappelant le tissu ganglionnaire. Dispersion des éléments lymphoïdes. Quelques follicules persistent, mais n'offrent aucun signe d'activité. Rares hématies. Cellules conjonctives tuméfiées riches en pigments. Sclérose légère.

Pancréas.—Infiltration à mononucléaires du tissu conjonctif interlobulaire. Ectasie vasculaire. Dislocation et raréfaction des acini et des îlots de Langerhans. Hypoplasie glandulaire.

Foie.—Dégénérescence graisseuse en îlots englobant la plus grande partie du lobule sur toute l'étendue du fragment examiné. Infiltration lymphoïde et sclérose discrètes. Dans le foie, le pancréas, la rate, l'hypoplasie glandulaire est très nette.

NGUYEN-THI-NGO, 15 ans, bouffissure et tuberculose péritonéale.

Rate.—Forte réaction conjonctive. Sclérose des vaisseaux, tendance a l'homogénéisation. Raréfaction de la pulpe rouge.

Pancréas.—Stase veineuse. Sclérose, pas d'îlots de Langerhans visibles.

Foie.—Cirrhose intralobulaire. Dilatation vasculaire. Nombreux noyaux en pycnose : infiltration lymphoïde discrète.

NGUYEN-THI-THE, 59 ans, bouffissure et ulcère de l'estomac en voie de transformation cancéreuse.

Rate.—Très scléreuse. Rares follicules de Malpighi visibles. Sclérose des cordons de Billroth. Lésions endothéliales et sclérose des vaisseaux.

Pancréas.—Sclérose accusée, îlots de Langerhans peu visibles à nombreux noyaux pycnotiques.

Foie.—Stase veineuse, sclérose des vaisseaux et cirrhose discrète. Dégénérescence graisseuse très étendue masquant complètement la disposition lobulaire. Hypoplasie nucléaire des cellules hépatiques.

Dans ces trois cas, Bablet a constaté une hypoplasie glandulaire nette du pancréas et de la rate avec sclérose hépatique. Ces constatations expliquent la dénutrition profonde qui constitue le principal symptôme de la bouffissure. La suralimentation est sans effet sur ces malades, du fait que les principales glandes digestives sont lésées. Le pancréas est incapable de transformer les substances protéiques en acides aminés. L'hypoplasie pancréatique est aggravée par celle de la rate, car nous connaissons aujourd'hui le rôle important de celle-ci dans la transformation des substances nutritives azotées. Sa fonction trypsinogène a été établ[illegible]

L'unanimité des réponses concernant les épidémies de bouffissure, qui vient confirmer nos constatations personnelles, est un des éléments d'appréciation les plus importants pour fixer l'étiologie et la pathogénie de la maladie

C'est très certainement parce que nous avons eu la chance de voir sur place l'épidémie de Quang tri que nous avons été amené à rechercher les taux d'urée sanguine et que nous avons pensé à essayer les injections sous cutanées d'une acide amine comme traitement de la maladie

Il n'est pas inutile de donner une esquisse brève de cette épidémie

Envoye en mission à Quang-tri pour y faire une enquête demandee par le médecin de la province sur une épidémie sévère qu'il croyait être du beriberi nous avons d'abord trouvé l'ambulance du chef-lieu entièrement occupee par des malades atteints d'œdèmes généralisés d'anémie intense et de diarrhee Tous les autres malades avaient été évacues pour faire place aux nouveaux venus qui étaient entasses sur les lits et sur des nattes étendues à terre dans tous les coins disponibles

Chez aucun de ces malades nous n'avons constaté les symptomes nerveux caractéristiques du béribéri abolition du reflexe rotulien, paraplégie, hyperesthesie musculaire, sensation douloureuse de constriction thoracique, nevrite cardiaque avec altération du rythme, etc Par contre, pour avoir eu depuis plus d'un mois le service des bouffis à l'Hôpital de Hué, nous avons cru pouvoir porter immédiatement le diagnostic de bouffissure épidémique

Nous avons alors appris que tous ces malades provenaient des 'Chantiers de misere' installés sur divers points de la province pour rassembler et nourrir la population privee de ses foyers et de sa récolte par le dernier typhon

La visite d'un de ces chantiers nous a démontré que tous ses hôtes étaient atteints à des degrés divers de 'bouffissure' Sous un grand hangar en paillotte 5 à 600 personnes étaient réunies pour prendre le repas fourni par l'Administration. Ce repas se composait de riz et de sel Les individus les plus ingambes avaient récolté dans les environs du cours d'eau voisin quelques plantes aquatiques (liseron d'eau), qui constituaient la friandise complétant ce frugal repas, dans lequel la ration de riz était d'ailleurs à peu près égale à la ration normale d'un Annamite au repos

Depuis plusieurs mois, toute cette population avait été soumise à ce régime et même, au début, à un régime encore plus pauvre, en attendant que l'Administration ait pu se procurer l'énorme quantité de riz nécessaire pour nourrir toute une population sinistrée

Tous les individus présentaient des signes d'une anémie très prononcée et des œdèmes des membres inférieurs et de la face L'amaigrissement et la fonte musculaire étaient plus ou moins évidents selon les malades, mais existaient chez tous Ce qu'il y avait de plus frappant et de plus attristant dans cette grande misère était l'état des quelques nourrissons qui avaient encore survécu au drame. Pendus au flanc de leur mère dont le sein ne donnait plus que quelques gouttes de lait, ils laissaient tomber sur le vêtement de leur nourrice les souillures de la

Chefs des trois provinces du Centre-Annam, Quang-tri, Thua-thien, et Quang-nam. où la Bouffissure se présente avec une grande fréquence. Elle a été conduite auprès des Mandarins provinciaux, qui ont fait connaître librement leur point de vue indiquant les causes de la maladie à leur entière convenance.

La bouffissure est désignée en Annamite par le terme Bênh Phù-thung qui comprend tous les œdèmes avec ou sans hydropisie. Les réponses s'appliquent donc à toutes les catégories d'œdèmes sans distinction, mais le nombre des cas de néphrites avec anasarque étant très faible par rapport aux cas de bouffissure dans la région où a porté notre enquête, il n'y a pas lieu de tenir compte des erreurs du diagnostic.

Nous avons reçu les réponses des 17 Phu et Huyên où la bouffissure est la plus fréquente (les phu et les huyên correspondent aux sous-préfectures de chez nous).

Les questions posées et les réponses ont été les suivantes :

1° L'œdème généralisé (Bênh Phù-thung) existe-t-il à l'état endémique dans votre circonscription ?

Les réponses ont été 17 fois oui.

2° Les villages atteints se trouvent-ils au bord de la mer, à la montagne ou dans la plaine ?

Seize réponses signalent que la bouffissure n'existe pas au bord de la mer et qu'elle est plus fréquente à la montagne que dans la plaine.

Une seule réponse admet qu'elle existe partout.

Cette dernière réponse émane du huyên de Cam-lô situé dans la montagne et dont le territoire ne touche pas à la mer.

3° La bouffissure présente-t-elle une recrudescence après une disette affectant l'ensemble de la population, disette consécutive aux inondations, typhons, etc.

Dix-sept réponses positives.

Deux des huyên ajoutent que malgré cette recrudescence, donnant une allure épidémique à l'affection, celle-ci ne parait pas contagieuse.

4° Dans le cas affirmatif, quelle est la période qui s'écoule entre le commencement de la disette et l'apparition de l'épidémie ?

Trois réponses indiquent un délai de deux semaines. Sept réponses : un délai de 1 à 2 mois. Toutes les autres : un délai supérieur à 2 mois et pouvant s'étendre jusqu'à 7 mois.

5° Lorsque la population a retrouvé le travail normal, par conséquent a repris l'alimentation normale, l'épidémie a-t-elle tendance manifeste à s'éteindre ?

Seize réponses : oui.

Une réponse signale que la plupart des bouffis sont morts après la disette.

6° Combien de temps l'épidémie met-elle pour s'éteindre quand la population a repris la vie normale ?

Réponses très variables : de 1 à 6 mois.

7° Quelle est la classe sociale la plus frappée par la bouffissure ?

Seize réponses : classe pauvre ;

Une réponse : aussi bien la classe pauvre que la classe riche.

Chez les gens très pauvres, le nuoc mam est remplacé par une saumure de [illegible]

Comme on le voit, la ration de riz est considérable, elle atteint certainement la quantité limite qu'un petit homme de 50 kgs soit capable de digérer.

En revanche, la ration d'albumine animale est insignifiante (inférieure à 10 gr.). Le nuoc mam tient probablement une place importante dans la valeur de cette ration. Préparé par autodigestion de poisson en présence d'une grande quantité de sel qui s'oppose à la putréfaction, il contient probablement en même temps que plusieurs acides aminés toutes les vitamines hydrosolubles que peut donner la chair de poisson. Les quelques aliments d'origine végétale qui figurent au menu, en dehors du riz, s'y trouvent en quantité si minime qu'on ne peut leur attribuer un rôle alimentaire important.

En somme, c'est le riz qui donne au paysan annamite de ces régions les 9/10 de sa ration alimentaire, aussi bien en substances hydrocarbonées qu'en substances azotées. Les aliments variables qui figurent au menu y sont en quantités si faibles qu'ils ne peuvent constituer un appoint important. Les végétaux utilisés sont des aliments pauvres contenant surtout de la cellulose. Les aliments d'origine animale sont invariablement des crevettes ou du poisson en quantité infime. Le nuoc mam ne compte que pour les vitamines qu'il peut contenir; c'est d'ailleurs le seul aliment cru de cette ration type, aliment très riche en vérité, mais qui en raison de son prix et de sa forte teneur en sel ne peut être absorbé qu'en trop petites proportions pour que les acides aminés qu'il contient puissent intervenir autrement que comme catalyseurs. Les corps gras sont fournis en quantité minime surtout par le riz [illegible]

[illegible]

diarrhée profuse qui les réduisait à un état squelettique, mal dissimulé par leurs ventres hydropiques et le gonflement œdémateux de leurs jambes.

Le tableau que nous venons de brosser rapidement n'est il pas celui d'une famine, famine particulière où le seul aliment est le riz et où manquent totalement les substances riches en azote : légumineuses, viande, poisson, lait.

C'est l'ensemble de ces constatations qui nous a amené à déclarer dans notre premier travail que la bouffissure est conditionnée par une carence azotée.

Ayant été en mesure d'apprécier la carence alimentaire des bouffis en temps d'épidémie, il nous restait à étudier la ration du paysan des régions à bouffissure en dehors de ces circonstances exceptionnelles. Nous avons déterminé cette ration au cours de plusieurs tournées dans les villages des environs de Hué, situés dans la zone cultivée qui s'étend parallèlement à la mer et à une distance de 10 à 20 km. de celle-ci. Notre enquête a été faite pendant l'été 1927, à une époque où les récoltes avaient été particulièrement abondantes et pendant la mousson du Sud-Ouest qui est la saison favorable pour la pêche en mer.

Le villageois annamite a deux rations types, selon qu'il travaille aux champs ou qu'il se repose. Dans le premier cas il fait trois forts repas par jour, le matin, à midi, et le soir, dans le second, il n'en fait que deux, le matin et le soir, avec au milieu de la journée, une collation légère qui se compose uniquement d'une soupe de riz (un peu de riz bouilli dans l'eau avec quelques herbes de façon à obtenir un liquide sirupeux).

Nous avons mesuré les rations soit au moment où elles sont servies prêtes à être mangées soit au moment de la préparation du repas. Elles sont remarquablement fixes, quelle que soit la fortune de l'habitant et quel que soit le village, dans toute la zone que nous avons prospectée.

Voici la composition de cette ration :

Ration forte pour une journée.

(Cultivateur en période de travail.)

Riz cuit	1.460 gr. (soit 750 gr. de riz cru).
Poisson cuit	25 gr.
Légumes cuits (aubergines, liseron d'eau, pastèque salée) ..	25 gr.
Nuoc-mam	10 c.c.

Ration faible pour une journée.

Villageois aisés ne fournissant pas de travail musculaire : bijoutier, prêteur, cultivateur au repos, etc.

Riz cuit	1.120 gr. (soit 580 gr. de riz cru).
Poisson cuit	25 à 50 gr.
Légumes	25 gr.
Nuoc-mam	10 c.c.

assurée par la main de l'homme avec des moyens très ingénieux mais très primitifs qui ne se prêtent pas à la mise en valeur de grandes etendues De ce fait, la récolte du riz qui suffit à la nourriture de la population ne permet pas une exportation importante qui, en produisant la richesse, faciliterait les échanges et en particulier le commerce du poisson conservé (poisson sec, poisson sale)

Pour la même raison, le riz etant employe à peu près entièrement à l alimentation de l'homme, il n'y a pas d'excedent pour l'elevage des animaux domestiques comme au Tonkin ou en Cochinchine Quelques buffles de travail et un cochon pour 2 ou 300 habitants, tel est à peu près le cheptel d'un village annamite de la région qui nous intéresse

Pour en finir avec le chapitre de l'étiologie, disons que, à l'inverse de ce qu'a pu constater Kerandel chez les malades d'Hopital, la bouffissure n'epargne pas plus les vieillards que les enfants Chez les enfants au sein, l'évolution est extrêmement breve Quand la bouffissure se déclare chez la nourrice, le nourrisson deperit et meurt en deux ou trois jours après avoir présente des œdemmes et une diarrhée profuse qui résiste à tous les traitements

PREBOUFFISSURE

Un des résultats les plus interessants de l'enquete que nous poursuivons depuis un an sur le terrain même ou evolue la maladie, a éte la decouverte d'un type particulier que nous proposons d'appeler le prébouffi

Dans les periodes d'abondance et de bonnes recoltes comme celles que l'Annam a connues dans ces deux dernieres années, les bouffis vrais sont relativement rares (un cas pour mille habitants environ) En revanche on trouve un assez grand nombre d'individus (1 per cent environ) qui presentent les signes suivants anemie prononcee avec décoloration marquee des conjonctives et de la langue, faible développement musculaire, flaccidité des téguments, paresse intellectuelle avec hebétude et inaptitude au travail Ces malades ne sont pas gênes par leur affection au point de songer à se faire hospitaliser et ils échapperaient completement à nos investigations si nous n'allions les chercher chez eux Ill est tout à fait remarquable qu'ils fassent partie de la classe la plus pauvre du village Ce sont ou des orphelins, ou des misereux qui n'ont ni feu ni lieu, ou des infirmes atteints de quelque affection chronique qui les rend inaptes au travail Dans un pays où l'aisance est inconnue, la charité est reduite au minimum Tout individu qui ne travaille pas est une lourde charge pour la communaute et sa ration alimentaire est strictement proportionnelle à la valeur des services qu'il est capable de rendre

La parenté de la prebouffissure avec la bouffissure vraie est évidente Les examens cliniques viennent la confirmer Le prebouffi presente a un degré moindre les mêmes signes que le bouffi diminution de la tension arterielle, du nombre des globules rouges, du taux d'hémoglobine, de l'urée sanguine et de l'urée urinaire A la première aggravation de la carence alimentaire les œdèmes apparaitront et le prebouffi deviendra un bouffi Il nous est arrivé de trouver dans une même famille d'orphelins plusieurs enfants prebouffis et un bouffi vrai, celui ci etant passé de la

La pression artérielle maxima moyenne est de 11,1 pour les hommes et 10,6 pour les femmes ; la différentielle est normale.

L'artério-sclérose, l'hémorragie cérébrale, le diabète, l'obésité sont totalement inconnus ou très rares. Alors que l'hyperglycémie est la règle (1·50 de glucose par litre de sang), nous n'avons pu trouver qu'un cas de diabète en deux ans et demi sur 20.000 malades hospitalisés à l'Hôpital de Hué. La dyspepsie hypersthénique avec ou sans ulcère de l'estomac, les calculs urinaires, l'asthme et la tuberculose sont extrêment fréquents.

La bouffissure enfin, pour revenir à notre sujet, paraît strictement cantonnée sur cette bande de terre qui s'étend parallèlement à la mer et à la Chaîne Annamitique. à 10 ou 15 kilomètres de distance de la côte, de la frontière de la Cochinchine à celle du Tonkin, avec un maximum d'intensité dans la partie centrale, du Cap Varella à la Porte d'Annam.

Il est en effet remarquable que la bouffissure ne soit signalée dans aucun autre pays de l'Union indochinoise : Tonkin, Laos, Cambodge, Cochinchine. En ce qui concerne cette dernière, notre confrère et ami Montel, qui depuis plus de 25 ans s'est occupé avec la compétence que l'on sait de la pathologie indigène nous donne sur la bouffissure le précieux renseignement suivant :

Dans toute sa carrière cochinchinoise Montel a la certitude de s'être trouvé quatre ou cinq fois en présence de malades atteints de bouffissure d'Annam. N' ayant alors aucune connaissance de cette affection, il a dû étiqueter ces cas 'Béribéri fruste' tout en se rendant compte que ce diagnostic n'était pas satisfaisant. Il croit se rappeler qu'il a rencontré ces quelques cas uniquement chez des travailleurs agricoles provenant de l'Annam, où ils avaient été recrutés.

Pour résumer ces considérations étiologiques nous retiendrons que :

1° la bouffissure a un domaine géographique très restreint qui s'étend de la Cochinchine au Tonkin avec son maximum d'intensité dans le Centre-Annam. Cette région est précisément celle où le poisson est le plus rare. La Mer de Chine est poissonneuse aux embouchures du Mékong et du Fleuve-Rouge. Le poisson s'y fait de plus en plus rare au r fuet à mesure qu'on s'éloigne de ces points privilégiés.

Les rivières de l'Annam, qui sont en réalité des torrents sur la plus grande partie de leur parcours, contiennent également très peu de poissons, contrairement aux grands fleuves du Tonkin, de la Cochinchine, du Cambodge et du Laos.

Dans la région même où elle existe, la bouffissure est d'autant plus rare qu'on ... du bord de la mer, d'autant plus fréquente qu'on s'en éloigne.

... bouffissure ne se rencontre que chez les Annamites, population essen... végétarienne ... ichtyophage, qui ne se livre pas à la chasse, ne s'intéresse ... tradition et sa civilisation, répugne absolument à faire ... ents de fortune d'origine animale, comme le font les ... ..., etc.).

... une ... pauvre au point de vue agricole, ... rend l'irrigation difficile. Celle-ci doit être

peut même concevoir que la cachexie ankylostomiasique n'est qu'une forme spéciale de la bouffissure dans laquelle la carence alimentaire peut ne pas intervenir, si le nombre de parasites est tel que l'organisme ne puisse plus arriver à reparer les pertes qu'ils occasionnent.

En ce qui concerne la syphilis, nous ne pouvons adopter l'opinion émise par Kerandel

Le pourcentage respectif des Wassermann positifs chez les bouffis et dans la population prise au hasard, qui ne représente qu' une différence de 13 pour cent au bénéfice de la bouffissure, ne permet pas de soutenir cette hypothese, surtout si l'on tient compte de ce que chez les bouffis ayant un Wassermann positif, celui ci devient négatif dans un grand nombre de cas sans l'intervention d'aucun traitement specifique, quelque temps après la guérison Tout au plus, peut on dire que certaines tares, relevant de l'hérédo syphilis, ou certaines lésions tertiaires, qui créent, chez ceux qui en sont atteints, un état d'infériorité les rendant moins aptes à la lutte pour la vie, interviennent comme causes prédisposantes

Rappelons en terminant que la plupart des auteurs ont reconnu avant nous que les trois affections dont ils ont fait le point de depart de la bouffissure (paludisme, ankylostomiase, syphilis) pouvaient manquer toutes les trois dans un certain nombre de cas L'association de deux d'entre elles n'atteint pas 50 pour cent et la fréquence des cas où l'on constate une seule d'entre elles ne dépasse pas sensiblement celle que peut atteindre le même parasitisme chez les indigènes pris au hasard dans des régions indemnes de bouffissure

Les parasitismes divers doivent donc être definitivement ecartés comme causes essentielles ou nécessaires de l'affection qui nous occupe

Diagnostic differentiel

Au debut de ce paragraphe, il nous paraît utile d'insister à nouveau sur les symptomes essentiels de la bouffissure qui doivent nécessairement se trouver réunis pour justifier le diagnostic de cette affection

Pour qu'on puisse à un premier examen songer à la bouffissure, il faut que soit réalisee la triade suivante anemie marquee (moins de 50 pour cent d'hémoglobine), fonte musculaire, œdème

Si l'on n'est pas d'accord sur ce point et si l'on tend à faire entrer dans le cadre de la bouffissure des affections cryptogénétiques comptant au nombre de leurs symptômes un œdeme quelconque, aucune discussion n'est possible.

Ce premier point étant admis, le diagnostic doit être fait.

1° Avec le béribéri—Les symptômes nerveux du béribéri manquent totalement dans la bouffissure.

Le bouffi peut marcher, prendre la position accroupie et se relever comme un homme normal Les reflexes tendineux sont conservés

Ce signe à lui seul permet de differencier la bouffissure du béribéri humide même si celui ci s'accompagne d'une anémie prononcée et d'amaigrissement.

préboufiissure bénigne à la bouffissure grave à la suite d'une cause accidentelle qui a pu être insignifiante (accès de paludisme, par exemple).

La prébouffissure est particulièrement intéressante parce qu'elle nous fait connaître l'ordre d'apparition des symtômes somatiques de la bouffissure, qui sont successivement : l'anémie, la fonte musculaire et en dernier lieu les œdèmes ; et parce qu'elle nous permet de rattacher le bouffi à l'Annamite normal par un type intermédiaire, qui nous amène à concevoir une prébouffissure latente chez tous les habitants de la région agricole. L'habitant normal des campagnes d'Annam présente en effet à un degré encore atténué des signes de carence : un faible développement musculaire, l'absence presque complète de tissu adipeux, une tension artérielle basse, une excrétion urinaire qui ne dépasse guère 10 à 12 gr. en 24 heures. L'urée sanguine et le taux d'hémoglobine sont cependant normaux chez le campagnard sain. Ainsi la bouffissure pose à la nation protectrice un véritable problème social sur lequel nous reviendrons à la fin de ce mémoire.

Bouffissure et Affections Favorisantes.

Si la carence azotée apparait comme la cause déterminante de la bouffissure, il n'en est pas moins vrai que certaines affections et en particulier les affections cachectisantes jouent un rôle important dans l'étiologie et le pronostic de cette maladie.

Nous avons déjà vu au chapitre de l'anatomie pathologique que chez l'un de nos bouffis, la maladie était compliquée de cancer du pylore et que chez un autre, elle s'accompagnait de tuberculose peritonéale (forme fibro-caséeuse). Nul doute que dans ces deux cas, la tubercueose et le cancer n'aient favorisé, en raison de leur localisation et de l'inanition plus moins complète qu'ils entretenaient chez leurs porteurs, le déclenchement du syndrôme bouffissure. Cela explique également que le traitement habituel soit resté sans eftet chez ces deux malades dont les gains ne pouvaient arriver à compenser les pertes.

Cependant ces complications se rencontrent exceptionnellement dans les milieux où évolue la bouffissure. Très fréquentes, au contraire, sont les affections auxquelles nos prédécesseurs ont attribué le rôle essentiel dans la pathogénie de la maladie : paludisme, ankylostomiase, syphilis.

Le paludisme, surtout, parait avoir une influence importante sur l'installation de la maladie.

L'augmentation du nombre de cas, au fur et à mesure qu'on se rapproche de la région montagneuse et inculte, peut être expliquée aussi bien par la difficulté progressive du ravitaillement en poisson que par la plus grande fréquence du paludisme. Ces deux causes additionnent probablement leurs effets.

De même, l'ankylostomiase crée une prédisposition à la bouffissure ou aggrave celle-ci, quand elle a fait son apparition.

Il est tout à fait logique d'admettre que l'hématozoaire et l'ankylostome sont des facteurs importants de carence par la spoliation abondante d'albumines (hémoglobine, albumines du sérum) qu'ils exercent sur leurs hôtes. On

jour sous la peau du flanc ou de la face externe de la cuisse pendant 10 jours consécutifs Les series de 10 injections sont renouvelees apres des intervalles de dix jours pendant lesquels le malade reçoit des injections intraveineuses d une solution de citrates et de tartrates selon la formule suivante

Citrate de soude	52 gr
Citrate de magnesie neutre	10
Tartrate ferrico potassique	2
Citrate de manganese	5 milligrammes
Eau	1 000 gr

(1 8 de centimetre cube par kilog de malade)

Cette partie du traitement est plus particulierement dirigee contre l anemie et contre la formation des caillots vis a vis desquels elle parait avoir a la fois une action curative et preventive

Sous l influence de ce traitement le taux de l uree sanguine et urinaire se releve rapidement les œdemes disparaissent l appetit augmente avec le nombre des hematies et le taux d hemoglobine L aspect du malade se modifie D abord squelettique apres la disparition des œdemes celui ci refait peu a peu des reserves adipeuses sous cutances reprend progressivement son volume musculaire et devient bientot normal

Apres trois ou quatre mois de traitement le malade peut etre renvoye chez lui l'experience ayant demontre que l amelioration continue meme lorsqu il reprend son regime habituel et ses occupations normales

Notons que le bouffi grave ne retire aucun benefice du traitement classique des œdemes (purgatifs drastiques chlorure de calcium per os digitaline theo bromine, etc) mais qu au contraire ces medicaments, tres mal supportes provoquent souvent une aggravation de l etat general

Pronostic et Complications

Avant le traitement par le glycocolle le pronostic de la bouffissure était tres grave variable cependant selon qu il s'agissait de bouffissure a evolution lente en dehors des epoques de disette ou de bouffissure a evolution rapide succédant a un cataclysme

95 pour cent Mor[illegible]

symptomatique des œdemes aussi bien que le traitement [illegible] des affectio favorisantes (paludisme et ankylostomiase) joints a une alimentation rationn e aboutissent rarement a une guerison complete [illegible] le malade rt de l'Hopital ameliore *mais fait une rechute des qu il est* [illegible] son village

Le traitement que nous avons indiqu [illegible] améliore le pron [illegible] au point de le rendre extremement benin [illegible] complications dont *la* plus grave est l embolie consecutive a la [illegible] d un caillot Cet a ident est cependant rare et ne se produit [illegible] semaine apres [illegible] *deb[illegible]* traitement

2° Avec les cardiopathies—L'œdème des bouffis peut faire penser à celui des cardiopathes à la période de décompensation. Les souffles anémiques du bouffi peuvent en imposer pour des souffles organiques. L'erreur est encore plus facile si le bouffi est en puissance d'un caillot intracardiaque engagé dans un orifice artériel. Nous avons signalé cette complication chez un de nos malades. Cependant en règle générale, l'angoisse et l'impotence de l'asystolique le distinguent facilement du bouffi qui reste, malgré ses œdèmes, relativement alerte. D'autre part, il faudrait une coïncidence singulière pour que se retrouvent chez un malade asystolique l'anémie et la fonte musculaire de la bouffissure.

3° Avec la néphrite hydropigène—Ce diagnostic différentiel est plus délicat. Il peut arriver, en effet, qu'une néphrite chronique s'accompagne de cachexie et, par conséquent, d'un amaigrissement assez considérable. Il peut arriver également qu'un néphritique soit anémié. L'anémie est même habituelle dans les néphrites chroniques et appréciable surtout dans la forme hydropigène qui crée une diminution relative du nombre des globules rouges relevant de l'état de dilution du sang.

La confusion devient d'autant plus facile que dans les deux affections le taux de l'urée urinaire est fortement abaissé. C'est là que le dosage de l'urée sanguine prend une importance primordiale. Comme nous l'avons déjà dit, le taux de l'urée sanguine est toujours faible dans la bouffissure. Compris le plus souvent entre 15 et 25 centigrammes pour 1.000, nous l'avons vu descendre jusqu'à 10 centigrammes et n'atteindre que très exceptionnellement le taux normal de 35 centigrammes. En même temps le taux de l'urée urinaire des 24 heures vaire de 2 à 9 grammes. Chez le même malade, ces taux varient d'un jour à l'autre selon l'élimination de l'urée. Chez tel sujet dont l'élimination urinaire atteindra son maximum, par exemple 8 grammes, l'urée sanguine tombera à 10 centigrammes. Le lendemain ou quelques jours après, ce même individu n'éliminera que 4 grammes d'urée urinaire et le taux d'urée sanguine montera à 20 centigrammes.

On voit donc que dans tous les cas les chiffres d'urée sanguine sont tellement inférieurs à ceux que l'on trouve dans les néphrites, même les plus bénignes, qu'aucune confusion n'est possible entre les deux maladies. Nous considérons cet élément de diagnostic comme absolument indispensable dans les cas doûteux. Ainsi que nous l'avons déjà dit, il est regrettable qu'il ait fait défaut à Thiroux et à Kerandel. Nous devons dire toutefois que ce symptôme important peut disparaitre momentanément lorsqu'un bouffi paludéen est en période d'accès. Le paludisme aigu et le traitement par la quinine sont capables de faire monter pendant un jour ou deux le taux de l'urée urinaire et de l'urée sanguine aux environs de la normale; mais dès que l'accès est passé et le traitement supprimé, on retrouve des chiffres encore plus bas qu'avant la crise.

TRAITEMENT.

Le glycocolle est le traitement spécifique de la bouffissure. Nous employons actuellement une solution au 1/10 dans l'eau distillée, dont on injecte 2 à 5 c.c. par

Chez les habitants de cette région, elle frappe les individus soumis à une carence proteique encore plus grande pour des causes diverses pauvreté, parasites spoliateurs de proteines disette

Le mecanisme compensateur est l'autophagie musculaire qui permet à l'individu de resister pendant quelque temps

Cette serie de faits confirme bien qu il s agit d une carence de substances azotees, carence qui devient tres grave quand les glandes digestives en particulier le pancreas, ont perdu leur activite physiologique normale

Que des injections de glycocolle à des doses faibles (20 centigrammes par jour) suffisent a faire disparaitre tous les symptomes morbides et permettent a l organisme de refaire en meme temps qu une reserve normale de graisse son systeme musculaire, c est la le fait important qui doit nous servir de fil conducteur pour arriver a circonscrire nos recherches En somme le probleme se reduit a expliquer l'action du glycocolle Le nombre des hypotheses possibles parait restreint

Premiere hypothese *Le glycocolle est capable de donner par synthese à l'interieur de notre organisme tous les autres acides amines*

Selon cette hypothese le glycocolle serait capable a lui seul de contrebalancer une carence proteique totale

C est invraisemblable Les nombreuses experiences des physiologistes (Abderhalden Willcock Hopkins Mendel) sur l alimentation azotee par les divers acides amines ont demontre non seulement que le glycocolle n etait pas capable de remplacer les autres acides amines mais que son absence dans la ration alimentaire n'avait pas d importance primordiale les animaux pouvaient vivre et s'accroitre pendant plusieurs semaines avec un regime amine completement depourvu de glycocolle D'autre part, les faibles quantités de ce produit necessaires pour obtenir la guerison indiquent bien qu il ne sert pas a couvrir une carence azotee totale

Dans tous les cas, un animal en experience, qui ne reçoit sa ration d'azote que sous forme de glycocolle, meurt rapidement

Deuxieme hypothese –*La ration alimentaire qui determine la Bouffissure est completement depourvue de glycocolle et de substances proteiques capables de produire cet acide amine, dont la presence est indispensable à l'entretien de notre organisme*

Cette hypothese merite d'etre verifiee, malgre les resultats experimentaux que nous venons de rappeler ci dessus Les regimes synthetiques experimentaux ne sont jamais maintenus au dela de quelques semaines Si le glycocolle se trouve dans l'organisme animal sous forme de reserve, l absence de cet acide amine dans la ration n'a pas le temps de se faire sentir dans un delai aussi court Au contraire, si le glycocolle est tres rare dans le produit de la digestion tryptique du riz et du poisson, la carence de ce corps peut s'etablir lentement et progressivement au cours de la longue période de prebouffissure qui precede l'apparition de la bouffissure grave Nous savons que certains acides amines agissent comme adjuvants dans les actions diastasiques Le glycocolle, notamment, jouit de la propriete d'activer

Pathogenie.

En abordant le chapitre de la pathogénie nous entrons dans le domaine des hypothèses c'est-à-dire des larges discussions contradictoires. Que des camarades qui nous ont précédé en Annam aient amorcé ces discussions nécessaires, nous ne saurions trop les en remercier, car c'est par elles qu'on arrivera à la vérité.

Ils nous excuseront de les contredire encore ici, avec toute la courtoisie que mérite leur grande compétence à laquelle nous tenons à rendre hommage.

Dans la discussion qui a suivi la communication de Kerandel à la Société de Pathologie exotique, Marcel Leger s'est exprimé ainsi : 'Faire dépendre la bouffissure d'Annam d'une triple étiologie : ankylostomiase, paludisme, syphilis, n'est pas pour satisfaire l'esprit. Dans certaines de nos colonies, en Guyane par exemple, aux Antilles, sur la côte d'Afrique, le nombre des ankylostomés, des paludéens, des syphilitiques est aussi élevé qu'en Annam et la curieuse maladie n'existe pas.'

Reprenant cet argument pour notre compte, nous ajouterons qu'en Indochine même et sur la même race, la bouffissure n'existe pas en Cochinchine où les porteurs d'ankylostomes, les paludéens et les syphilitiques sont au moins aussi nombreux qu'en Annam, et où le climat est plus débilitant.

L'étroitesse du domaine géographique et l'allure épidémique que l'affection est susceptible de prendre après les disettes, nous paraissent écarter définitivement les divers parasitismes comme cause principale, tout en leur laissant une place importante comme causes accessoires.

La diminution de l'urée sanguine et de l'urée urinaire, la fonte musculaire, les résultats obtenus par les injections de glycocolle plaident bien en faveur d'une carence azotée, qui cadre d'ailleurs parfaitement avec la pauvreté de la ration alimentaire en substances quaternaires.

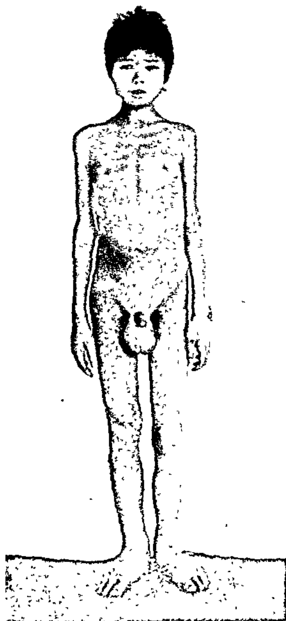
Kerandel nous dit : 'Nous ne pensons pas que la seule carence azotée puisse suffire à provoquer des troubles aussi graves que ceux de la bouffissure d'Annam.' Nous ne sommes pas de son avis. L'azote joue dans la constitution de la substance vivante un rôle trop important pour mériter d'être traité avec mépris. Il est bien certain qu'un être vivant doit souffrir du manque d'azote aussi bien que du manque d'oxygène ou de carbone et qu'une carence d'azote de quelque importance n'est pas compatible avec la vie. Il est même évident que l'assimilation des protéines est le plus difficile et le plus compliqué des divers actes digestifs que doit accomplir un animal supérieur comme l'homme pour entretenir son organisme en état d'équilibre.

Est-ce-à dire que l'expression 'carence azotée' soit pleinement satisfaisante ? Nous avouons bien volontiers que non. Cette explication trop simple cache notre ignorance. Elle renferme une part de vérité mais pas toute la vérité : nous allons tâcher de serrer de plus près les données du problème.

La bouffissure sévit uniquement dans la région d'Indochine où les protéines d'origine animale ou végétale sont réduites au minimum dans la ration alimentaire de la population.

PLANCHE XVII.

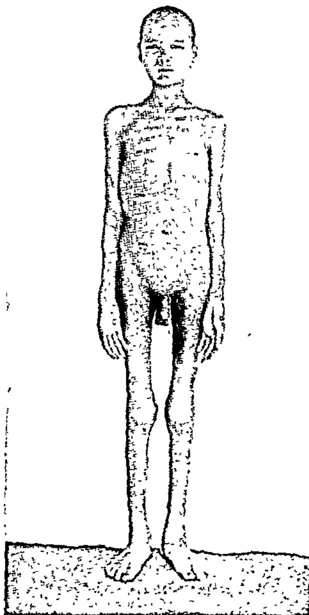
TRUONG-DINH, 20 ans.



entrée ôpital	Poids	. . . .	37 k.
	Numération globulaire	. .	282.500
	Hémoglobine	. . .	10 pour cent.

Œdèmes et ascite

TRUONG-DINH



après un mois de traitement	Poids	. . .	34 k.000
	Numération globulaire	. .	1.260.000
	Hémoglobine	. .	40 pour cent.

Disparition des œdèmes et de l'ascite.

PLANCHE XVIII

TRUONG-DINH

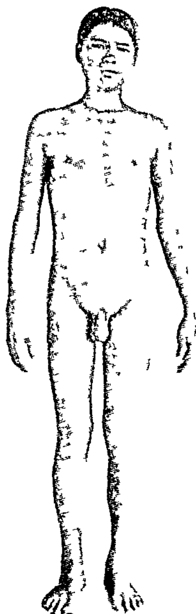




après 6 mois de traitement, à sa sortie de l'Hôpital	Poids	46 k 000
	Numération globulaire	5 120 000
	Hémoglobine	70 pour cent

Période d'engraissement

TRUONG-DINH

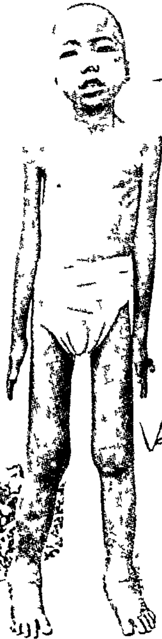


sept mois après sa sortie de l'Hôpital	Poids	48 k 500
	Numération globulaire	4 600 000
	Hémoglobine	100 pour cent

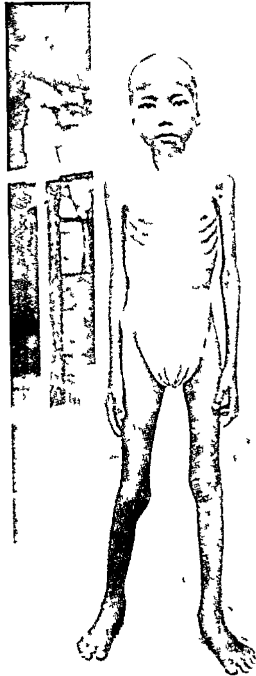
Période de développement musculaire. Le malade qui a repris un travail pénible a diminué ses réserves de graisse au profit de ses muscles comme l'atteste son augmentation de poids.

Planche XIX

Nguyen Thi Nuoi 12 ans



Nguyen thi Nuoi



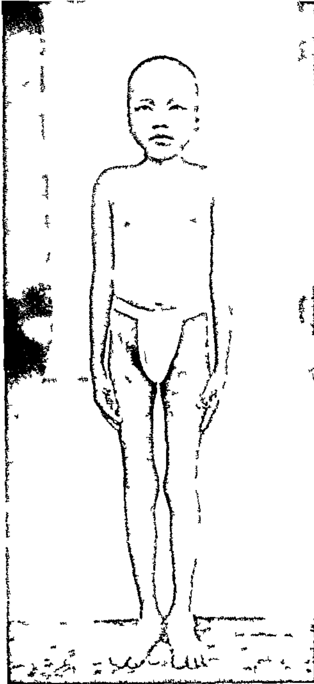
A l'entrée à l'Hôpital	Poids	18 k 600	après un mois de traitement	Poids	13 k 000
	Numération globulaire	650 000		Numération globulaire	1 500 000
	Hemoglobine	15 pour cent		Hemoglobine	30 pour cent

Œdèmes et ascite

Disparition des œdèmes

PLANCHE XX

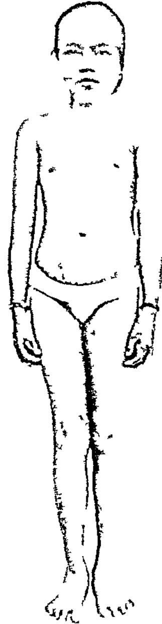
NGUYEN THI NUOI



après sept mois de traitement à sa sortie de l'Hôpital	Poids	20 k 800
	Numération globulaire	4 260 000
	Hémoglobine	70 pour cent

Période d'engraissement

NGUYEN THI NUOI



dix mois après sa sortie de l'Hôpital	Poids	31 k.000
	Numération globulaire	4 300 000
	Hémoglobine	90 pour cent

Période de développement musculaire

Similarly, conditions which are only occasionally seen in the west, such as anomalies of pigmentation, leprosy, severe types of folliculitis on the legs, usually a mixed infection of fungi and staphylococci, a variety of dermato-mycoses, particularly those affecting the palms and soles, etc., are of daily occurrence in this country and of course cases which are essentially tropical are also occasionally seen. such as maduro-mycoses, dermal leishmaniasis, beriberi, etc.

(2) A modification in the character of certain lesions due to a variety of causes, such as sunlight, tropical heat, habits of the people, effects of civilization, etc., occurs.

(3) Certain affections are noted which *appear to be new* and hitherto undescribed in dermatological literature.

This third group of cases is of great academic interest from the dermatological point of view.

In what ways factors like tropical heat, sunlight, habits of the people, effects of civilization, etc., influence the character and incidence of certain skin affections in the Tropics.

As some observations on these lines have already been made by previous workers. I shall only deal briefly with the more obvious ones.

Sunlight.—We know from our modern methods of heliotherapy that light has got some effect on diseases like lupus vulgaris and psoriasis. and these are the very conditions which are either rare or modified in the tropics. Lupus vulgaris is an exceedingly rare affection in the tropics, and this is directly attributable to the profusion of actinic rays in the atmosphere. The people of Bengal, particularly the poorer classes. wear very few clothes during the summer, and in the winter they are in the habit of exposing their bodies to the direct rays of the sun. Any tubercle bacilli lurking about the skin. being thus directly acted on by the actinic rays are either killed or attenuated and lupus vulgaris, if it develops at all, tends to be of the fibroid type Of tubercular affections those usually seen are scrofuloderma. This is due to the fact that the skin involvement in scrofuloderma is only *secondary* to some underlying tubercular bone or lymphatic gland which is of internal origin and over which the sunlight has no direct control.

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MY EXPERIENCE ABOUT DERMATOLOGY IN THE TROPICS

BY

A GUPTA, M B,

Honorary Dermatologist, Howrah General Hospital,

and

Out patients' Department, Carmichael Medical College Hospitals, Calcutta

In this paper my attempt will be to describe briefly what my general impression has been about tropical dermatology after attending some skin clinics in the west My observations are, however, mainly clinical, and not of the type one would expect from a research worker having the facilities of a well equipped laboratory

First impressions about tropical dermatology A comparison between dermatological clinics in the west and in the Tropics

The idea that the pigmented condition of the skin would be a bar to proper recognition of skin diseases was soon found to be erroneous Also the usual belief amongst medical men in this country that skin affections are less common in the tropics, is far from the truth In the tropics where dermatological affections often assume a much more severe form due to secondary contaminations, neglect *on the part of the patients to pay proper attention to their skin diseases, the debili*tated condition of most individuals and a large number of leprosy and leucoderma cases, all add to the list of tropical skin diseases, and rouse more interest in dermatological clinics than anywhere in the west Cases of dermatological interest, such as epidermolysis bullosa, porokeratosis, acrodermatitis chronica progressiva, etc, also seem to be of more frequent occurrence in this country

The statement that tropical dermatology is entirely different from western dermatology, is not altogether correct If a rough comparison is made between dermatological clinics in the east and the west, the main differences noticed are as follows —

(1) *Incidence of Disease* —Certain conditions which are commonly met with in the west are rare in this country and vice versa. The *microsporon audouini* infection of the scalp in children and lupus vulgaris, for instance, which are of common occurrence in any dermatological clinic in a country like England, are decidedly rare in this country.

Similarly, conditions which are only occasionally seen in the west, such as anomalies of pigmentation, leprosy, severe types of folliculitis on the legs, usually a mixed infection of fungi and staphylococci, a variety of dermato-mycoses, particularly those affecting the palms and soles, etc., are of daily occurrence in this country and of course cases which are essentially tropical are also occasionally seen, such as maduro-mycoses, dermal leishmaniasis, beriberi, etc.

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Sunlight, while exerting a beneficial influence on some, is responsible for the higher incidence of other affections, e g , anomalies of pigmentation Freckles, for instance, which are due to the action of sunlight on a sensitive skin, are quite common in the tropics They are seen not only in fair skins, but in dark skins also Fortunately, however, they show little tendency towards developing into zeroderma pigmentosum

Tropical heat, probably more than anything else, is responsible for the aggravation of many skin affections by keeping the parts moist and sodden with perspiration, by bringing lethargy in men thereby promoting the condition known as ' status seborrhicus, and by favouring the growth of micro organisms Dermatitis of the groin is a common example in which the sodden condition of the skin forms a suitable soil for the growth of fungi and streptococci Conditions due to ' status seborrhicus ' such as furunculosis, seborrhic dermatitis, etc , are exceedingly common, particularly during the summer Seborrhea capitis with eczematization is, however seen mostly in children and less commonly in adults The daily washing their scalp, by adults an affair which children cannot properly manage for themselves, is responsible for this variation The aggravation of skin diseases, particularly by secondary contaminations, is seldom observed by dermatologists in the western countries to a similar extent

The beneficial effect of heat, on the other hand, is seen in the case of lupus erythematosus, which is a comparatively rare affection in this country The chief factors in the causation of lupus erythematosus are, some internal toxæmia and a sluggish circulation of the blood, particularly at the flush area of the face, due to exposure to cold In a warm climate the chance of such a flushing is less and consequently the incidence of the disease is considerably reduced

Effects of Civilization —Diseases which are directly or indirectly attributable to the effects of modern civilization are less frequent in this country India is not an industrial country, and it is only natural that the various forms of ' trade dermatitis ' which are of common occurrence in European countries, are mostly absent here The cases of ' trade dermatitis ' that have so far come under my notice are those due to *semicarpas anacardium*, teak wood, umbrella polish, and iodoform Acton has made valuable observations on jute dermatitis, which is prevalent amongst workers in jute mills

Other conditions which are more or less influenced by civilization are alopecia areata, lichin planus, hypertrichosis, etc Alopecia areata, which is due to a trophoneurotic disturbance of the hair roots, although commonly seen in ' country, seldom develops to the extent of ' alopecia totalis ' as is seen in .' Lichen planus, which is in some way related to derangements of the system, is relatively rare, and is mostly seen among the educated r' among the uneducated Hypertrichosis of the face in women, which is

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connected with the effects of civilization, is also rare in this country as compared to its incidence in the European countries.

Remarks on certain skin affections commonly met with in the Tropics.

Fungal Affections.—There are about 43 varieties of pathogenic fungi in a temperate region like England. The more we come towards the east the more varieties we get, till at last in the tropics we get innumerable varieties, some of which still remain to be classified. Fungal affections are by far the commonest of the skin diseases in adults. Curiously enough, *microsporon audouini*, which is the only fungus known to be of human origin, is conspicuous by its rarity. It is commonest in England and gradually becomes rarer in the eastern countries of Europe. It is doubtful if it grows at all in tropical countries. So far only three cases of *microsporon audouini* affecting the scalp have come under my observation. They were all English school children coming from Mussoorie. Whether the fungi were imported from England or grow in the cold climate of Mussoorie can only be said after further investigation.

Regarding treatment, the much reputed Whitfield's ointment is usually a failure in effecting a cure in most fungal affections. It usually relieves but does not cure. Even in the case of eczematoid ringworm between the toes, the treatment is not often successful. Whitfield believes that the persistence of the affection is due to the presence of thick capsules around certain spores which he prefers to call 'resting spores.' Sabouraud speaking about the treatment of the same condition says 'scrape it off.' A most necessary adjunct, however, is the treatment of the *moist condition* as well as the use of strong anti-fungal remedies; for even after apparent eradication of the fungi and their spores, if the part is kept moist, the condition is bound to recur.

Certain types of ringworm, such as the granulomatous type, or those occurring in the regions where the skin is thick, are singularly resistant to treatment, and even an ointment containing 25 per cent of resorcin and 6 per cent each of acid salicylic and chrysorobin, continued over a prolonged period, fails to bring about a radical cure. In dealing with most ringworms, which are sometimes of very wide distribution, a good plan is to first bring the lesions under control by Whitfield's ointment, and then deal with the resistant patches with stronger remedies. For obstinate patches strong solution of trichlor-acetic acid, acid nitrate of mercury, etc., are under trial. Those undergoing eczematization or contaminated with secondary organisms of course require special attention. The cheiro-pompholyx type and the [illegible] form chiefly affecting the palms and soles are sometimes remarkably influenced by intravenous injections of sodium thiosulphate solution.

Impetigo.—These are the commonest of skin diseases in children just as fungal affections are in adults. The children in Bengal, even those belonging to the more [illegible] of people, often suffer from a poor state of health. Streptococcal [illegible] in such children usually assumes an ecthymatous form and may have

have freer play on the skin. His observations are well corroborated by the study of psoriasis in the tropics.

Sunlight, while exerting a beneficial influence on some, is responsible for the higher incidence of other affections, e.g., anomalies of pigmentation. Freckles, for instance, which are due to the action of sunlight on a sensitive skin, are quite common in the tropics. They are seen not only in fair skins, but in dark skins also. Fortunately, however, they show little tendency towards developing into zeroderma pigmentosum.

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an irritant to the skin as well as a stimulant to the errant skin cells to secrete the specific substance, which forms the melanin.

Eczema.—The prevalent view amongst most medical practitioners in Calcutta to-day is that, barring scabies, ringworm, syphilis and leprosy, most skin diseases are *eczemas*. There is another extreme view that there is no such disease as eczema in the tropics - all so-called eczemas being in reality 'streptococcal dermatitis.' From my observation, however, eczemas are eczemas in this country as they are elsewhere in the world, but of course the chance of secondary contaminations is greater here. Whether we ought to use the term 'eczema' or 'dermatitis' for such conditions depends upon whether a particular condition is of internal or of external origin.

Eczema is not due to any known organism *in situ* on the skin, and the name 'eczema vaccine' (which is prepared from materials obtained from skin lesions) is scientifically incorrect.

Affections which appear to be new and hitherto undescribed in dermatological literature.

Occasionally cases are met with, which appear to be new and whose description is not seen in dermatological literature. Some of these conditions may be briefly described.

I. *A variety of 'Chromo-keratosis.'*

A Parsee boy, aged 20, consulted me for a peculiar cayenne pepper-like staining of the dorsa of the hands and fingers, which came on regularly during the summer, to disappear spontaneously in the winter months. There were no subjective symptoms. By vigorously rubbing with a piece of cloth or with the palm of the hand, the stained cuticle could be rubbed off and collected in powder form on a piece of paper, leaving the underlying skin normal in appearance. An examination of the scrapings with liquor potassæ under the microscope did not show any fungi. The patient believed that he had contracted the disease through bathing in the Wellesley tank. Acid salicylic, 4 per cent in glycerin of starch, cleared up the lesion completely within a few days, but it re-appeared in the usual season. The condition is likely to be due to some chromogenic fungus, which may be revealed on further search.

II. *Follicular affections mostly about the extensor aspect of the extremities.*

These may be grouped as follows:—

1. *A variety of 'winter papules.'* These are dome-shaped papular lesions of [illegible] the size of split pea, and situated about the dorsal aspect of the [illegible]. They are mostly seen in adult males belonging to the United [illegible]. They [illegible] to disappear in the summer and re-appear in the [illegible]. [illegible] the lesions were rapidly retrogre[illegible] with the [illegible] up to Darjeeling. The cold climate there at [illegible]

about the patient for years, thus being a source of infection to others and son the cause of fatal septicæmia in themselves Such cases have been diagn eczema, bed sores, syphilis, or even as tuberculosis of the skin, and treated a with only doubtful benefit The attention of parents is directed to the con of their children when such patients are refused vaccination during smal epidemics Cases have come under my observation in whom vaccination ha be postponed for as long as five years owing to the presence of ecthyma

Leucoderma —This very unsightly affection of the skin has been a bar to s able marriage in some and the cause of grave mental worry in others Leucoder is probably due to a lack on the part of certain skin cells to secrete the prop substance which, combining with the pre melanin bodies circulating in the bloo forms melanin Factors influencing the formation of pre melanin bodies do no cause leucoderma Factors affecting the secretion of skin cells cause leucoderma Most probably some toxæmia of gastro intestinal origin is responsible for this and not the endocrines In support of the above theory following selected examples may be given —

(1) If a subject of leucoderma is exposed to light, hyperpigmentation occurs in the normal areas but not at the leucodermic patches Light causes hyper secretion of the skin cells by stimulating them and hyper pigmentation results This is an example of cell stimulation by an external agent

(2) When a woman suffering from leucoderma becomes pregnant, regions like the areola of the nipple etc become hyper pigmented while the leucodermic areas remain unaffected In this case all facilities for hyper pigmentation are given to the skin from the internal source but the leucodermic areas, where the function of the skin cells is defective, are incapable of utilizing them

(3) Cases of both leucoderma and melanoderma occurring in the same individual have come under my observation In this case the pre melanin bodies in the circulation remain the constant factor, it is the skin cells that are responsible for de pigmentation or hyper pigmentation at particular areas

In a subject whose pigmentary balance of the skin is out of gear, leucoderma may appear either spontaneously or at a particular area due to the action of some local irritant Such irritation may be caused by mechanical pressure such as a *dhoti* worn tightly round the waist, or by skin diseases such as eczema, seborrhœic dermatitis, ringworm, etc, or by chemicals applied to the skin, such as a hair dye, or as a result of treatment of chronic skin diseases by stronger remedies Leucoderma thus developed may heal up completely or partially, or may be persistent

For treatment preparations of the seeds of *psoralia corylifolia*, commonly nown as 'babchi' are by far the best of all local applications Babchi acts as

DISCUSSION.

Dr. Ganapati Panja (Bengal): From the experience gained from the examination of 1,500 to 2,000 cases seen in the skin outdoor clinic of the Calcutta School of Tropical Medicine gave it as his opinion that ringworm was the commonest skin disease; next in order came seborrhœic dermatitis, streptococcal and staphylococcal infections, leucoderma, leprosy, etc. Skin diseases were more chronic and skin affections, due to the tubercle bacillus, were less common. Folliculitis of the legs due to *tinea violaceum* with a secondary staphylococcal infection was frequently seen. A large number of cases was due to internal causes in which the endocrines played a large part, hypo-thyroidism being the commonest cause. Mixed infections were common: lichen planus was not. The belief that sunlight prevented psoriasis was probably not correct.

Dr. J. M. Henderson (Bengal): I should like to congratulate Dr. Gupta on his excellent paper on 'Dermatology in the Tropics.' My experience of skin diseases is much more limited than his, but one sees a considerable number of cases in leprosy practice. I wish to ask for information on two points: (*a*) What is Dr. Gupta's experience of the general condition in leucoderma? Acton and his followers have found evidence of dysenteric infection in a considerable proportion of such cases. (*b*) In what percentage of cases does Dr. Gupta find syphilis as a factor in the causation of melano-leucoderma?

Dr. A. Gupta (Bengal): In reply to Dr. Henderson, said:—

The work on the gastro-intestinal flora in connection with leucoderma is mainly Acton's; I have also had occasion to study the problem but on a smaller scale. The object of my paper was, however, to show that the endocrines are not, at least primarily, responsible for the causation of leucoderma and some of the evidence has been put forward to support my statement. I have chosen to lay particular stress on this point, because the theory of the endocrine origin of leucoderma is baffling not only workers in India but others in other parts of the world.

I am glad Dr. Henderson has raised the point referred to in his second question.

Syphilis is syphilis and leucoderma is leucoderma. A subject of leucoderma may have syphilis or not, and we ought not to mix up the two conditions on the ground that in a particular individual the two diseases co-exist. The pigmented condition of the skin in the tropics affords ample facilities for studying anomalies of pigmentation, and I have found that de-pigmentation and hyper-pigmentation side by side may be brought about by many skin diseases—common examples are scabies and leprosy. Just as we would not like to call the de-pigmentation produced by such conditions 'scabitic leucoderma' or 'leprotic leucoderma,' we ought not to look upon a similar condition produced by syphilis as 'syphilitic leucoderma.' We would rather use the term 'secondary' or 'pseudo-leucoderma' for these conditions to clearly differentiate them from the 'primary' or 'real leucodermas.' The essential difference between 'primary' and 'pseudo-leucoderma' is that the pigmentary function of the skin is just the reverse in the two conditions. In pseudo-leucoderma (which is incidentally due to some obvious lesion on the skin) the usual tendency of the affected area is to revert to its original pigmented condition after the causative factor has been removed, while in primary leucoderma the tendency of the skin is to de-pigment itself in spite of our various attempts to restore pigmentation in it.

affected the course of the disease the lesions became darker in colour and appeared in an aggravated form He was recommended thyroid internally exposure to X rays for the lesions

2 *Lesions similar in appearance to the winter papules but usually of m extensive distribution and not showing any seasonal variation* —This is quite common affection seen in adult males and in the poorer classes of people It exceedingly prevalent among workers in oil mills probably due to some irritatio at the hair follicles aided by a mild staphylococcal affection

Acid salicylic 6 per cent in ung hydrarg oleas may be used with benefit Sometimes stronger remedies may be necessary such as shelling off the lesion with 12 per cent acid salicylic in collodion and subsequent application of strong sulphur preparations combined with phenol resorcin and acid salicylic

III *Granulomas*

Sometimes odd cases of granulomatous lesions are seen which have been provisionally looked upon as septic granuloma from the clinical point of view Salicylic cresote plaster 30 per cent CO snow applications etc have given good results in my hands

IV *Melanodermias*

These are primary melanodermias without any local cause They may be roughly grouped as follows —

1 *Melanodermia of the face with a lupus erythematosus like distribution* is a common affection seen in both rich and poor usually in adult males and middle aged women The colour of the lesions is brownish black It may spontaneously disappear and re appear It is evidently of internal origin either connected with gastro intestinal disorder or endocrine disturbance The hyper pigmentation may be removed by local de pigmentary applications but usually there is a recurrence

2 *Localised Melanodermia* may occur anywhere but is mostly seen on either side of the neck It has the appearance of a plain pigmented non vascular naevus Unlike a pigmented mole however it is an acquired affection and not of congenital origin Local de pigmentary treatment has got some effect on the lesions

3 *Generalised Melanodermia* may have a generalized distribution including he mucosa It may start on the face or other regions and gradually spread in ther directions or it may have a generalized distribution from the very beginning t is usually seen in adults and in either sex and is probably more common in ales than in females The lesions may be slate coloured or brownish black The neral health remains unimpaired The blood pressure is normal and there is no tro intestinal disturbance Von Pirquet reaction is negative It is not connected h kala azar or malaria and is usually uninfluenced by any form of treatment

PATHOLOGY.

DIABETES IN THE EAST.

I.

THE NORMAL FASTING BLOOD-SUGAR AMONGST INDIANS AND THE RENAL THRESHOLD FOR SUGAR IN INDIANS.

BY

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and

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INTRODUCTION.

I HIGHLY appreciate the privilege of recording a few opening observations on diabetes mellitus in the east; for diabetes is to us, whose life work lies in India, a subject of considerable practical interest, and I welcome you, and especially our distinguished visitors from overseas, to the opportunities of this discussion on diabetes in the east.

Between diabetes as it occurs in the West and diabetes as seen in India, there are points of similarity as well as points of contrast. And this one would expect, for diabetes the whole world over is fundamentally the same disease modified as it may be by the environment, diet and physical energy of the race in whose country the disease is especially studied.

THE NORMAL INDIAN FASTING BLOOD-SUGAR LEVEL.

Without doubt, an important part of the picture of diabetic research is held at present by blood-sugar examination. In my own department of pathology at King George's Medical College, Lucknow, some thousands of blood-sugars have now been estimated, mainly by Dr. Mangalik, firstly demonstrator and now [illegible] Singh research scholar, and I am greatly indebted to him for the [illegible] with which he has carried out these blood-sugar investigations.

The term 'pigmentary syphilide' is in vogue and is used for the condition k as the 'necklace of Venus', described by the French as 'cafe au lait' mottling seen usually in women about the neck during the secondary period of the disease is also seen in late cutaneous syphilides in which the scarring hyper pigmentation de pigmentation occur side by side—a picture not to be easily mistaken

The cases cited by me are, however, not syphilitic either clinically or serolo cally

In reply to Dr Panja I have to repeat what I have already said My point is tha when I compare western dermatology with tropical dermatology I find certain differ ences The difference mainly lies in the following (1) *Incidence*—Some diseases are common *here* others are common *there* Lichen planus is certainly seen there but from my observation it is *less common* here The disease is the same in the east and the west (2) *A modification in the character of some diseases*—I selected psoriasis as one of the examples It is undoubtedly modified in the tropics If I hold any tropical factor responsible for this, certainly it will be *sunlight* and I have shown grounds for my belief (3) *New affections*—There are others no doubt I have only made an attempt to mention some of them

My main object in preparing my paper as I did was to remove the vague impression that exists in our minds that tropical dermatology is entirely different from western dermatology

Diabetic admission rate of the British Army and Indian Army.

I was fortified in this opinion by finding that the *diabetic admissions* per 10,000 strength (over the years 1915 to 1926) amongst Britishers of the British Army in India was 0·76 as compared with 0·80 amongst Indians of the Indian Army. That is, there was no practical difference in the diabetic admission rates for Britishers and for Indians, in spite of the marked diet contrast, when the physical exercise of the two groups was sufficient to fully utilize the diet consumed. If Indians could take sufficient exercise to completely metabolise the high carbohydrate diet they consume or, *per contra*, if Indians could lessen their carbohydrate intake to suffice only for the physical work each undertakes, then their blood-sugar and their diabetic morbidity and mortality would approximate those of Britishers in India. There is nothing in race itself. The diabetic tendency is merely a question of the balance of diet and exercise.

Fasting blood-sugar per cent of Indians in military employ.

With these considerations in view I therefore arranged for the fasting blood-sugar level of 50 Indians of the Army Bearer Corps to be estimated. These men were in perfect physical condition and trained for the hardest marching while carrying stretchers. The average fasting blood-sugar level of these men worked out, as I almost expected it would do, at 0·10 per cent exactly.

There were 23 vegetarians and 30 so-called non-vegetarians, the only practical difference being that the latter were given meat once a week. The average fasting blood-sugar for these two groups was practically the same, being 0·102 per cent for the vegetarians and 0·100 per cent for non-vegetarians. As regards age, 26 of these Army Bearer Corps men were between 18 and 25 years, with a blood-sugar of 0·102 per cent and 27 were between 26 and 35 years with an exactly similar average. As regards weight again, there was no practical difference, 26 men between 88 and 125 lbs. having a fasting blood-sugar of 0·101 per cent and 27 men between 126 and 156 lbs. an average of 0·101 per cent. We are thus led to believe that, provided a man is in perfect physical health and in constant physical exercise, his blood-sugar does not vary with his weight, age, or even with his diet, provided again these variations are within reasonable limits.

Conclusions.

It would, therefore, appear that race *per se* has no effect on the fasting blood-sugar level, nor has diet alone when the calorie value of that diet is being entirely consumed by hard physical work. In all such cases, the normal fasting blood-sugar whether of Britishers or of Indians, averages 0·10 per cent. But when hard physical work is not being undertaken, then, on a vegetarian diet (in which may be included the so-called Indian non-vegetarian diet) the fasting blood-sugar rapidly rises from 0·10 per cent to 0·12 and 0·13 per cent. With this increase in blood-sugar is associated increase in weight and progressive physical disability,

Civilian Indians

The first point was to determine the *fasting*, that is the *before breakfast*, centage of sugar in the blood amongst *healthy* Indians

McCay found that amongst 50 Bengalees of average health and appearan the average blood sugar percentage was 0 13, whilst the average figure for the p hard working Bengalees stood at 0 12 per cent and that for the fat indolent Bengal at 0 15 per cent McCay was careful to exclude any person whose urine reduce Fehling's solution

I am glad we have with us to day Capt Bhatia of Bombay and Dr Bose o Calcutta who have worked on this point and whose results we shall hope to hear at first hand From their published papers it would seem that in the main their figures run somewhat parallel to McCay's

In my own laboratory, we collected 60 healthy Indians, 10 vegetarians and 10 non-vegetarians in each of the age groups of 15—25, of 26—45, and of 46—65 The sample included students, doctors, laboratory attendants and hospital patients suffering from eye diseases The results are shown in the following table :—

TABLE

Average fasting blood sugar level in healthy civilian Indians in various groups

Age	15—25	26—45	46—65	All ages
Number of cases	20	20	20	60
Vegetarians	0 12 per cent	0 13 per cent	0 14 per cent	0 13 per cent
Non Vegetarians	0 11 "	0 14 "	0 14 "	0 13 "
Combined Vegetarians and non Vegetarians	0 12 "	0 13 "	0 14 "	0 13 "

There was no difference shown as between vegetarians and non-vegetarians and the figures in the main were in agreement with those of Col McCay and Capt Bhatia

Indians in military employ

But I was not satisfied as to the reason why so marked a difference should ist in the average fasting blood sugar level between the healthy Indian and the lthy European as between 0 13 per cent and 0 10 per cent It seemed to me t, provided a healthy Indian was doing sufficient physical work to fully utilize caloric value of his diet, it should not matter whether that diet was mainly of protein or one of carbohydrate

be differentiated by a careful consideration of all the facts of the case from the typical renal glycosuric which, in my experience, is most rare in India.

Moreover, the recognition of such cases of true dietetic diabetes with a low sugar threshold, will explain those cases occasionally reported in Europe as a renal glycosuria progressing into a true diabetes.

The question of the renal threshold for sugar is an important and interesting one. It is a common experience that the threshold for sugar may rise in old age and especially in chronic nephrities. I have also frequently observed that the blood-sugar will remain high above the normal renal threshold in a severe diabetic, even though he be rendered aglycosuric by diet or by insulin. A recent case under my care of severe thin diabetes in a boy of 20, whose urine had been cleared of sugar by a maintenance diet with insulin, had for many days a blood-sugar of over 0·24 per cent without glycosuria.

The raised renal threshold of old age, of chronic nephritics and of severe diabetics after treatment is recognized and has been well named 'masked diabetes.' From this variation in the renal threshold in severe and prolonged diabetes I am led to believe that in the earliest stages of mild diabetes a variation in the direction of a lowered threshold is in some cases not impossible, and indeed this is the actual condition which we in Lucknow have not infrequently observed.

such as shortness of breath on exertion in a typically fat and flabby, but a a non-glycosuric individual. Such a person has, however, now become a ca date for diabetes and is indeed already in the pre-diabetic state. By the time the fasting blood-sugar level has reached 0·15 per cent, our friend is proba already showing intermittent glycosuria after meals and has reached the seco stage in the development of dietetic diabetes.

Amongst my diabetic cases, the fasting blood-sugar percentage varied up 0·60 per cent with an average of about 0·30 per cent.

The variation in the blood-sugar level produced by individual meals, by diet by obesity, by physical work, and by age are fairly well recognized and our work at Lucknow has substantiated and extended the truth of these variations. There is not time, however, to refer further to such variations in our discussion on blood-sugar on this occasion

The Frequency of Renal Glycosuria in India and Variations in the Height of the Renal Threshold for Sugar.

The question of the frequency of true renal glycosuria in India and of its differentiation from mild and symptomless true dietetic diabetes is of considerable practical importance. In my opinion there is sufficient evidence of the existence of true but symptomless diabetes combined with a lowered renal sugar threshold. Such a condition cannot, by an examination of the blood-sugar curve alone, be at present differentiated from the renal glycosuria.

Let us consider a practical example:—A young applicant for Government service, or for life insurance, is found, possibly an hour or so after his main meal, to have a trace of sugar in urine. He states he is quite fit and that he has no symptoms. On plotting his blood-sugar, after 50 grammes of oral glucose, a curve below the average maximum European renal threshold of 0·17 per cent is found and, if judged by this test alone, the applicant would be classed as a renal glycosuric.

If the diagnostic differentiation of these two conditions by the blood-sugar curve alone be accepted, then renal glycosuria is indeed a very common disease in India and such individuals need have no anxiety of their future. It is here, however, that the experience of a special interest in Indian glycosurics and Indian diabetics since 1913 applies a corrective on the clinical side. Our young candidate is a fat young man of sedentary habits and clinical experience unmistakenly ndicates that within a few years of time unless he exercises a strict supervision ver his diet and takes sufficient exercise, he will progress through the various ages of a fat dietetic diabetes. Again, though the maximum point of this ood-sugar curve does not perhaps rise above 0·15 per cent, yet probably his ting blood-sugar is already 0·12 per cent. Nor does this candidate behave to er tests as a renal glycosuric would do.

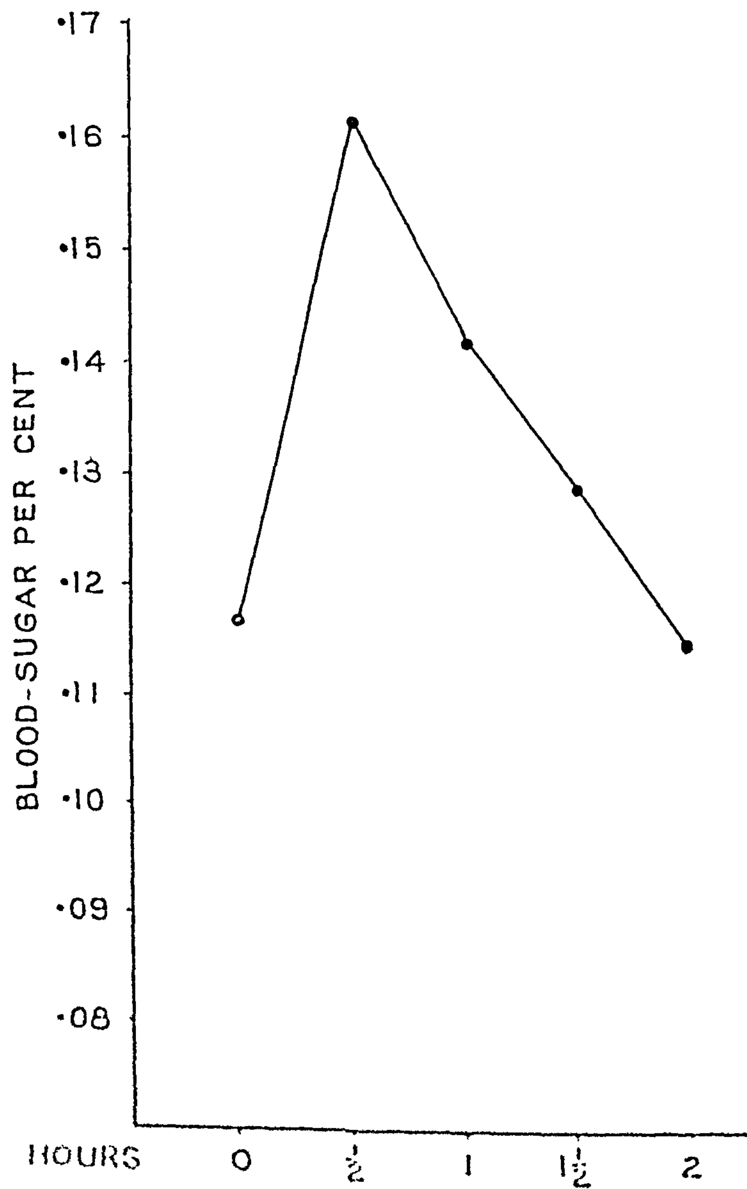
It is for such reasons that I believe that there is a distinct type of early and l dietetic diabetes with a lowered renal threshold. Such cases can afterwards

The average data obtained from *all* the 60 persons so examined are as follows :—

Average fasting level of blood-sugar	0·117	per cent.
Blood-sugar, ½ hour after the ingestion of 50 grms. glucose,	0·161	,, ,,
,, ,, 1 ,, ,, ,, ,, ,, ,, ,, ,,	0·142	,, ,,
,, ,, 1½ hours ,, ,, ,, ,, ,, ,, ,,	0·129	,, ,,
,, ,, 2 ,, ,, ,, ,, ,, ,, ,, ,,	0·115	,, ,,

The curve obtained from these figures is shown in Fig. I.

Fig. I.



SOME OBSERVATIONS ON INDIANS IN REGARD TO THE SUGAR CONTENT OF BLOOD AND THE SUGAR TOLERANCE TEST

BY

CAPT S L BHATIA I M S

Professor of Physiology Grant Medical College Bombay

THESE investigations were carried out on apparently normal human subjects all Indians between the ages of 17 and 40 years in order firstly to obtain normal standards regarding the sugar content of blood and secondly to determine their tolerance for carbohydrates It is a well known fact that Indians take a large quantity of sugar and starch as part of their diet In view of this dietetic habit and the peculiar tropical environment in which they live it was a question whether the data obtained here would differ in any way from those obtained in European countries I have now got data altogether from 60 normal persons The subjects of the experiments were partly medical students and partly members of the laboratory staff in the physiology school Grant Medical College Bombay

The plan of the work was as follows —

The diet age weight and height were recorded in each case The blood was obtained to determine the fasting level of blood sugar either in the morning after the night's fast or $4\frac{1}{2}$ to 5 hours after the last meal

For the sugar tolerance test, 50 grammes of glucose dissolved in 150 c cs of water were given and the blood sugar was estimated at half hourly intervals for two hours afterwards All estimations were carried out according to Maclean's method for 0 2 c c of blood The urine was also examined for sugar before, and at one hourly intervals after, the ingestion of the glucose

All the subjects were divided roughly into 'non vegetarians' and 'vegetarians' This division was not easy, as all Indians take large quantities of carbohydrates For practical purposes I included all those who never touch meat, and live habitually on dal, rice and vegetables as 'vegetarians' and the rest who take meat, eggs, fish etc , occasionally, as 'non vegetarians'

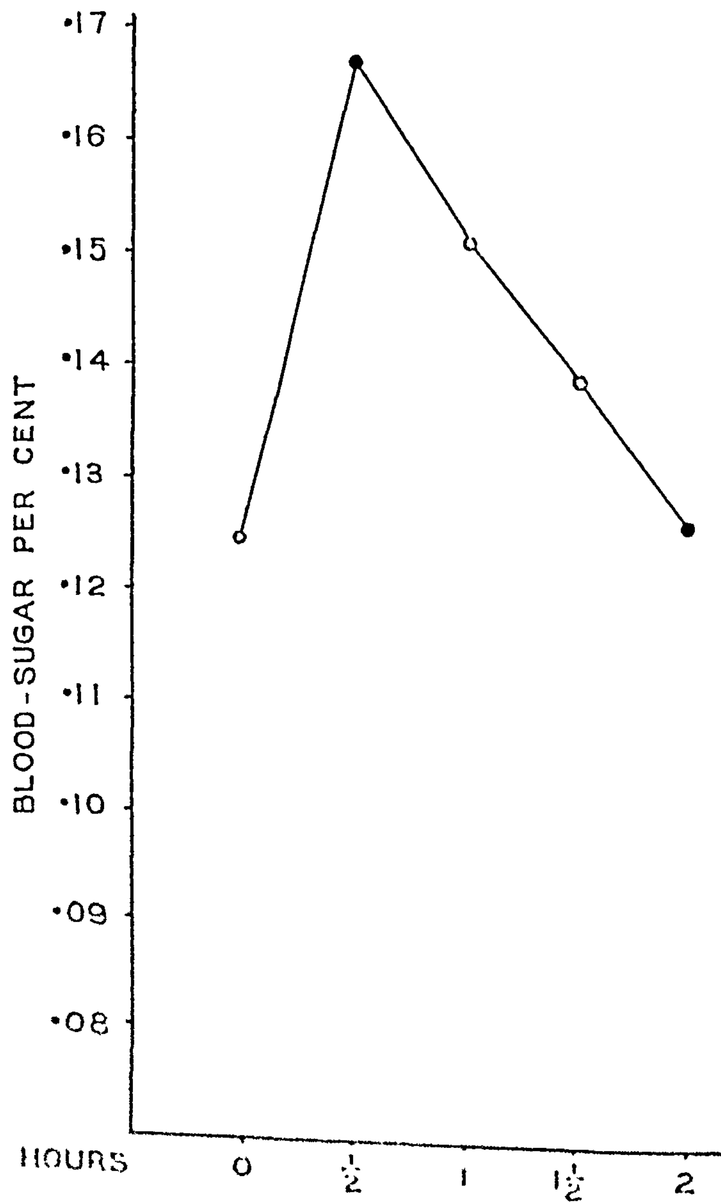
Vegetarians.

Out of 60, 31 were vegetarians. Their average fasting level of blood-sugar was .. .. 0·125 per cent.

Blood-sugar,	½ hour after the administration of 50 grms. glucose,	0·167 ,, ,,
,, ,,	1 ,, ,, ,, ,, ,, ,, ,, ,,	0·151 ,, ,,
,, ,,	1½ hours ,, ,, ,, ,, ,, ,, ,,	0·139 ,, ,,
,, ,,	2 ,, ,, ,, ,, ,, ,, ,, ,,	0·126 ,, ,,

The curve obtained from these figures is shown in Fig. III.

Fig. III.



Non-vegetarians.

Out of 60, 29 were non-vegetarians. Their average fasting level of blood-sugar was .. .. 0·107 per cent.

Blood-sugar, ½ hour after the ingestion of 50 grms. glucose,	0·155	„ „
„ „ 1 „ „ „ „ „ „ „ „	0·138	„ „
„ „ 1½ hours „ „ „ „ „ „ „	0 117	„ „
„ „ 2 „ „ „ „ „ „ „ „	0·103	„ „

The curve obtained from these figures is shown in Fig. II.

Fig. II.

All these factors do not act to an equal degree. As regards the cessation of absorption from stomach and intestine, it may be said, that it need not be regarded as a serious factor at all. Absorption of sugar does not stop in ½ to 1 hour as sugar can still be obtained by the stomach pump at the end of that period. Beeler, Bryan, Cathcart and Fitz(1) have introduced a sugar tolerance test on an improved principle, in which the technique is modified so as to give information as to the actual amount of sugar absorbed, by the removal of unabsorbed sugar at the end of the first hour, the amount of which is determined. This procedure gives the same type of curve, as the one employed by me, and which is advocated by Maclean(9).

The fact that, in cases of diabetes, the blood-sugar does not come down to its pre-glucose level also indicates that it is not cessation of absorption that is responsible for the fall.

Increased oxidation does take place to a certain extent. It has been estimated by Sanger and Hun that the excess of sugar thus oxidized during 2½ hours after intake of glucose, accounts only for 18 per cent of sugar. There is a rise in the respiratory quotient within ½ to 1 hour, indicating increased combustion of sugar in the tissues. It appears at the point where the fall in blood-sugar commences and continues for sometime after. This combustion does not account wholly for the sudden fall in the curve.

The main factor is the storage of glucose in the liver and tissues as glycogen. Sugars which are good glycogen formers (e.g., lævulose) when given produce no rise of sugar in the peripheral blood, if the liver is functioning normally, for the reason that they are rapidly and completely converted into glycogen. Another significant fact which supports the storage hypothesis is that the sugar tolerance curve obtained from venous blood is lower than that from arterial blood as obtained by a finger prick. This diminution represents the loss of sugar after the blood has circulated through the tissues. This loss is due to storage in muscles, which contain more than half the glycogen content of the body. This storage mechanism is at its height when the blood-sugar is rapidly falling after the first hour. It is found that a second dose of glucose during this phase of active glycogenesis does not produce a second rise in blood-sugar. In some individuals it may produce a slight rise, but it never reaches its former maximum level. Now it is precisely this storage mechanism which is upset in many persons who live on a rich carbohydrate diet.

It eventually leads to hyperglycæmia and glycosuria, especially if, in addition to a rich carbohydrate diet, the person leads a sedentary life and takes little physical exercise. Apart from flooding the liver with products of carbohydrates of the diet, alimentary hyperglycæmia may occur if there is any congenital or acquired defect in the glycogenetic function of the liver. Benedict, Osterberg and Neuwirth's(2) experiments show that the normal adult human being does not possess a complete tolerance for sugar, and the difference between a normal and diabetic person is purely quantitative only. We should all do well to follow their advice to observe caution in the use of sugar with our meals. People living on a rich carbohydrate diet are perilously near the border line which divides the

As regards the sugar in the urine, it was noticed that in the case of vegetarians there was a greater tendency for a slight trace of sugar to appear after the administration of glucose, than in the case of non vegetarians

Discussion

These observations show that the average fasting level of blood sugar in Indians is slightly higher than the figure quoted for European countries, namely, 0 1 per cent extremes being 0 07 per cent and 0 102 per cent, [Maclean, Cammidge(9) Rona and Doblin(10)] There are also slight but definite differences amongst Indians according to diet, the pure vegetarians having a slightly higher level of blood sugar than the non vegetarians

The sugar tolerance curve shows the same characteristic features as are reported from European countries The concentration of blood sugar rapidly rises from the basal figure to a maximum of 0 16 to 0 17 per cent in 30 to 60 minutes after the ingestion of glucose

After this, the amount begins to fall, and in many cases it falls lower than it was to begin with so that at the end of 1½ to 2 hours it is either at the pre glucose level or lower

The maximum blood sugar level of 0 18 per cent is regarded as the threshold value of sugar, for if the amount exceeds this level, glycosuria occurs Maclean(9) and his co workers insist that in healthy subjects with normal kidneys no excretion of sugar takes place until the concentration in blood reaches 0 18 per cent and that it is difficult or impossible to produce a concentration beyond this level

On comparing the curves from individual cases and also those obtained from average figures, it appears to me that the 60 persons examined taken as a whole show a poorer tolerance for carbohydrates than the inhabitants of European countries and that the non vegetarians on the whole have a better tolerance for sugar than pure ' vegetarians ' The number of vegetarians who have a relatively high fasting level of blood sugar, and a high peak of the curve, is greater than that of non vegetarians The renal threshold for sugar also appears to be lower th 0 18 per cent in many of the subjects of my experiments It seems to be mor the neighbourhood of 0 17 per cent

This diminished tolerance for carbohydrates in people consuming large i ties of starch and sugar appears to be associated in my opinion, to too great un on the mechanism by which glucose is stored as glycogen in the body

In the sugar tolerance test, the rise in blood sugar is obviously due to orption of glucose from the stomach and intestine The fall in the cur may be due to —

- (*a*) Cessation of absorption from stomach and intestine
- (*b*) Oxidation of sugar in the tissues
- (*c*) Excretion by the kidneys
- (*d*) Conversion into glycogen and its storage as such in the liver and muscles
- (*e*) Conversion into non carbohydrates such as fat

(3) BHATIA, S. L. and COELHO, G. (1925) *Ind. Jour. Med. Res.*, XIII, p. 141.

(4) *Idem.* (1925) .. .. .. *Ind. Med. Gaz.*, LX, No. 12.

(5) BRAHMACHARI and SEN (1925) .. *Ind. Jour. Med. Res.*, XIII, p. 271.

(6) *Idem.* (1925) .. .. .. *Ibid.*, p. 751.

(7) MCCAY, BANERJI, GHOSAL, DUTT and ROY (1918). *Ibid.*, VI, p. 485.

(8) *Idem.* (1916) .. .. .. *Ibid.*, IV, p. 11.

(9) MACLEAN, H. (1924) .. .. Modern Methods in the Treatment of Glycosuria and Diabetes.

(10) RONA and DOBLIN (1911) .. *Biol. Chem. Zeit.*, XXXI, p. 215.

(11) VAN LANGEN, C. D. and H. SCHUT (1918). Mededeel. Burgerl. Geneesk Dienst, Nederl. Indie., Ser. 3, 1. *Abstract Physiol. Rev.*, April 1927, Vol. VII, 341.

(12) *Idem.* (1918) .. .. .. *Ibid.*, Ser. 3, 26. *Abstract Physiol. Rev.*, April 1927, Vol. VII, 341.

(13) VAN LANGEN, C. D. (1928) .. *Ibid.*, Ser. 3, 62. *Abstract Physiol. Rev.*, April 1927, Vol. VII, 341.

DISCUSSION.

Dr. J. P. Bose (Bengal) : I thoroughly agree with Major Stott when he says that race *per se* has no effect on the blood-sugar level. The blood-sugar may vary, though slightly, due to the habits of the particular race. I also agree with Major Stott in that the people with a fasting blood-sugar of 0·15 per cent should be classed as potential diabetics or even as early cases of diabetes.

As regards the normal standard of the blood-sugar level in Indians I find that the average Bengalee, living on an ordinary mixed diet, usually has a blood-sugar varying from 0·08 per cent to 0·11 per cent exactly as in the case with Europeans. In the fat indolent type of person, the blood-sugar varies from 0·10 per cent to 0·12 per cent. Any figure of fasting blood-sugar level over 0·12 per cent, I consider distinctly pathological.

Regarding Capt. Bhatia's remarks : Hyperglycosuria and glycosuria occurring in apparently normal non-vegetarian Indians is quite different to my experience, I consider that to have hyperglycosuria over the renal threshold and to pass sugar in the urine after a test meal of glucose is distinctly pathological.

Capt. S. L. Bhatia, I.M.S. (Bombay) : In reply to Dr. Bose I wish to point out that I said in the course of my paper that the average level of blood-sugar is relatively high in vegetarians, not in non-vegetarians. It is in the vegetarians also that there is a greater tendency to glycosuria after ingestion of glucose. I suggested that this abnormality was apparently associated with a rich carbohydrate diet.

Dr. J. P. Bose (Bengal) : Replying to Capt. Bhatia's remark that non-vegetarian Indians who pass sugar in the urine after a test meal of glucose are cases of alimentary diabetes and not diabetes, my own opinion is that all cases of so-called alimentary glycosuria should be classed as true diabetes mellitus for the following reasons :—

(1) The term alimentary glycosuria is vague and it does not bring home the pathological condition associated with it to the mind of either the patient or his physician.

(2) It is impossible to raise the blood-sugar level over the threshold level in a normal healthy individual, however large may be the amount of sugar given to him.

healthy and the diabetic Once the storage mechanism in the liver is deranged and hyperglycæmia results, the B cells of the islets of Langerhans begin to suffer, resulting in true diabetes It is the common experience of most clinicians in India, that the diabetes met with in this country is readily controlled by dietetic measures, and usually runs a long course not marred by any very serious complications Many people suffer from glycosuria for 15 or 20 years and lead fairly normal and useful lives

There are numerous observations regarding the blood sugar level in the tropics McCay and his co workers(7 and 8) have published observations on the sugar of the blood and sugar in the urine in varying conditions in the Bengalee, and obtained high fasting sugar levels They have attributed this to the high carbohydrate content of the diet Brahmachari and Sen(5 and 6) have obtained similar results Van Langen(11, 12 and 13) also claimed to have demonstrated an exceptionally high sugar content in the blood of the healthy white inhabitants of the Dutch Indies, and blamed the climate for this abnormality He is of opinion that the diabetic should be warned not to immigrate to the tropics

I may be allowed to add that, during my recent visit to England, while talking on this subject one day with Professor Maclean, in whose laboratory at St Thomas's Hospital I was working, I was informed that he too had observed a similar behaviour of the blood sugar in some Indian students working in his laboratory, namely, a slightly higher fasting level of blood sugar and less perfect tolerance for carbohydrates as compared with that of English students My observations, as far as they go, confirm these findings, although I am not prepared to offer an opinion regarding the behaviour of blood-sugar of Europeans living in this country

Conclusions

1 The average fasting level of 60 Indians examined was 0 117 per cent which is slightly higher than the figures obtained in European countries

2 There are slight, but definite, differences between Indians as regards the sugar content of blood, people living on a pure vegetarian diet rich in carbohydrates having a higher amount than those living on a mixed diet

3 The tolerance for carbohydrate of these 60 persons as a whole is less perfect than that of inhabitants of European countries, and the tolerance of vegetarians is not so good as that of people living on a mixed diet.

4 It is suggested that the cause of this variation is the rich carbohydrate diet which the Indians take, and that the glycosuria, which is so prevalent in this country, is mainly dietetic in origin

References

(1) Beeler, Bryan, Cathcart and Fitz *Jour Metab Res*, 1, 549 (1922)

(2) Benedict, Osterberg, Neuwirth *Jour Biol Chem*, XXXIV, p 209 (1918)

DIABETES IN THE EAST.

II. Ætiological and Clinical Aspects of Diabetes in India.

BY

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CONTENTS.

I. What is diabetes mellitus ?

On this question I have no doubt we shall hear different views expressed. Some few years ago physicians were struck with the marked differences existing between the so-called alimentary glycosuria recognized as a chronic disease in elderly fat and heavy carbohydrate feeders and the acute thin ketonuric diabetes of children and young adults. If, however, we regard the fundamental pathology of diabetes mellitus as an excessive amount of blood-sugar then we must regard both the so-called alimentary glycosuria and acute diabetes as true diabetes, for in both conditions a marked hyperglycaemia exists though it is true that this hyperglycaemia is the result of two distinct causes, namely, in one case of a *primary excess feeding with a secondary islet cell exhaustion* and in the other case of actual and not relative *insulin deficiency from primary pancreatic islet cell deficit.*

As a result of this hyperglycaemia, similar complications affect both groups though each group develops special symptoms which are the result of the [illegible] and degree of the carbohydrate upset.

However, if we consider diabetes mellitus as synonymous with hyperglycaemia [illegible] within this disease two distinct types, viz., *dietetic diabetes* [illegible] *diabetes*. Between these two types there are the most [illegible] clinical condition, urine findings, prog[illegible] [illegible] of treatment.

(3) The effect of ingestion of 50 grammes of sugar on the blood sugar of a so called case of alimentary glycosuria shows a definite defect in the sugar storage mechanism which should be regarded as distinctly pathological

Major S S Sokhey, I M S (Bombay) Urged the use of the respiratory quotient for the diagnosis of diabetes To establish the diagnosis diminished ability to burn carbohydrate must be shown, also disturbed fat metabolism by the presence, in increased amounts of acetone bodies in the blood and urine Glucose tolerance curves are not a reliable guide to diagnosis, factors other than a defective pancreatic internal secretion are known to effect these curves

Major H Stott, I M S (United Provinces) replied This discussion has brought out the fact that there is but little difference in the findings of observers in Calcutta, Bombay and Lucknow as to the normal fasting blood sugar percentage in healthy Indians We have agreed that there is little in race but that it is mainly a difference in the diet physical exercise ratio The fasting figure is certainly lower than we formerly thought was the case and closely approximates the normal figures for Europeans and Americans, namely, 0 10 per cent Capt Bhatia's figures are a little higher and there is some slight variation between his vegetarian and non vegetarian group which I have not myself found No comments have been made upon the suggestion of the possibility of a true diabetes with a lowered renal threshold for which there is some evidence available Observations on this suggestion require to be more fully made in the future

stands as the *fifth* commonest cause of death amongst better class Indians, the first four causes being influenza (the mortality figures include the period of the great pandemic period of 1918), pneumonia, apoplexy, and phthisis. I feel sure that some of these deaths were terminal events in diabetes. Even if deaths returned as diabetes only be considered, then only four further diseases would precede diabetes on our list of the most frequent causes of death, viz., cirrhosis, enteric fever, malaria and dysentery. I feel convinced that we have scarcely grasped the extent of the large mortality indirectly due to diabetes amongst Indians.

Provincial distribution.—Through the courtesy of the administrative medical heads of the various provinces, I have estimated the number of diabetic out-patients attending the Government Hospitals in each province per 10,000 out-patients *attending for all diseases.*

TABLE I.

Proportion of diabetic attendances at hospital in various Indian Provinces.

Order.	Province.	Average number of out-patients treated in 1 year (average 1914—1926): All causes.	Average number of out-patients treated in 1 year (average 1914—1926): Diabetes.	Diabetic out-patients per 10,000 of total out-patients.
1	Madras	8,001,722	5,215	6·5
2	Bombay	2,572,831	1,072	4·2
3	Bengal	7,115,540	2,033	2·9
4	Punjab	5,352,322	1,290	2·4
5	U. P.	6,263,709	1,261	2·0
6	Nagpur (C. P.)	2,231,776	411	1·8
7	[illegible]	2,012,852	333	1·7
[illegible]	[illegible]	1,670,8[illegible]	165	1·0

The so called alimentary glycosuria can no longer be regarded as an insignificant condition to which popular opinion and even our own profession so often relegates it Dietetic diabetes in its earliest stages is often of no discomfort to the patient and is thus apt to be lightly regarded both by himself and often by his doctors But the modern physician with a preventive outlook foresees the frequent gradual onward march of this early insignificant glycosuria to fully developed dietetic diabetes, with ordinarily *a certain curtailment of life in the future,* and it becomes the physician's duty to warn and instruct his patient in this sense

II The Incidence of Diabetes in India

Morbidity —There is little doubt that all with experience will agree that diabetes is more common in India than in the West It is difficult to say to what degree diabetes is more common Even under the best conditions statistics of morbidity are not very helpful It is safer therefore to rely on the experience of sound observers, and we can accept I think this increased prevalence of diabetes in India as a fact without reservation

Severity —There is little doubt too that this increased frequency of diabetes is mainly one of the milder and more chronic types This has been accepted as a statement of general experience The old saying that no Indian was a gentleman who did not pass sugar by the time he was forty points out how frequent and how lightly regarded is this mild diabetes of India Many Indians indeed suffer no serious symptoms and but little inconvenience from their glycosuria nevertheless I believe that all the while metabolic poisons are producing a continued serious degeneration of their arteries which will in the end shorten life by many years Glycosuria amongst Indians should be regarded more seriously than has hitherto been the case

Mortality —As regards the mortality of diabetes in India it is again impossible to speak with any accuracy in the terms of figures But the mortality must be very high Death in diabetes is due to some complication of this disease, and even if the death is reported by a well qualified man it is as likely to be returned under some such infection as tuberculosis pneumonia, gangrene carbuncle or under some degeneration such as cerebral cardiac or renal arteriosclerosis as to the primary disease which is so much less dramatic and so much more insidious than the terminal event

One of the largest insurance societies in India has been good enough to supply me with their mortality figures from which I have calculated that the recorded diabetic death rate for Indians is four times higher than that amongst Europeans living in India as worked out over an average of the past ten years If death from carbuncle and gangrene be added to each group, then the Indian death rate is some six times higher than the European rate But I believe even these figures show a large under estimate

Numerical order of cause of death —The statistics of the same company show that if deaths from carbuncle and gangrene be included with diabetes, then diabetes

tuberculosis or pneumonia, or through a local infection such as carbuncles and moist gangrene. Death often results from such intercurrent infections. Should, however, the patient escape this grave danger of infection, then, in my experience, the metabolic poisons, acting through a long series of years, gradually paint the patient's picture as one of arteriosclerosis, and the curtain finally falls on a clinical picture of uræmia, of cerebral hæmorrhage, or of heart failure, depending on whether the arteriosclerosic lesion is mainly concentrated on the kidney, brain or heart arteries. It has not infrequently been my lot to observe this final act in the life drama of the diabetic and to recognize throughout the progressive development of these more or less distinct stages.

Albuminuria, diminished kidney efficiency, uræmia.—Albuminuria is far from uncommon amongst Indian diabetes and is far commoner than it is in Europe. Albuminuria is correlated with the length of the diabetic history rather than with its severity. It has seemed to me that it is usually evidence of renal arteriosclerosis. In India it is generally held that the appearance of albuminuria is of greater prognostic value than the amount of sugar passed ; and indeed many Indians show no undue alarm concerning their glycosuria until albuminuria appears, as it usually does after some 15 or 20 years of glycosuria.

In order to appreciate more fully whether there is any decrease in kidney efficiency in diabetes, Dr. Mangalik worked out in the pathology department, Lucknow, the urea efficiency concentration test in 14 of my diabetic cases and compared them with the standards for healthy Indians which had been previously arrived at. I set out these results in the following table :—

TABLE II.

Urea efficiency concentration test in healthy and diabetic Indians of various age groups.

Age Group	15—25	26—45	46—65	All ages.
Healthy Indians	3·3	3·0	2·7	3·0
Diabetic ,, ...	2·5	2·1	1·6	2·0
Decrease	0·8	0·9	1·1	1·0

These figures show a marked falling off in kidney efficiency in the diabetics at all ages, especially in those above the age of 46. Low efficiency figures are [illegible] with an arterial rather than a parenchymatous change.

[illegible] the frequency of uræmia in Indians as compared with [illegible] and such has been my own experience, but cerebral hæmorrhage and heart failure are also frequent modes of death in old diabetics. I feel that

To the nearest whole figure these results show that in Madras there are six diabetic attendances per 10 000 out patients in Bombay 4 and in Bengal 3 In a second group consisting of the Punjab United Provinces Central Provinces and Burma there are approximately two diabetic attendances whilst Assam shows one per 10 000 total out patients These figures support the general impression that diabetes is more common in the low lying areas of India where rice is mainly grown and eaten and where the moist hot climate is not conducive to active physical exercise as compared with the drier and in winter comparatively cooler areas of Central India

Religion and caste There is a most instructive comparison in India as between Hindus Mohammedans and Europeans The general views of experienced physicians in India is that Hindus are far more subject to diabetes than are Mohammedans or Europeans *This impression is supported by figures showing* that in Calcutta the diabetic death rate per 100 000 Hindus is some *five* times higher than the diabetic deaths per 100 000 Mohammedans The insurance mortality returns to which I have already referred show that the diabetic deaths per 100 lives at risk is 8 for Hindus compared with 3 for Mohammedans and 2 for Europeans in India This markedly higher Hindu mortality no doubt has reference to the larger carbohydrate diet and excessive amount of sweets consumed by Hindus both daily and on every festive occasion

There are *other factors* of considerable ætiological interest concerning diabetes in India, but I will not dwell on them further for they all have reference in the ultimate discussion to the two main factors concerned in the common type of Indian diabetes viz, an excessive carbohydrate dietary and diminished physical exercise

III Some points concerning the onward march of the dietetic or fat type of diabetes in India

First, second and third stages —In the first, or pre diabetic stage the potential diabetic is growing fat and flabby and his blood sugar and blood fat is rising

The second stage of mild and of intermittent glycosuria develops imperceptibly from this pre diabetic condition In the earliest stages of diabetes hyperglycæmia and glycosuria appear at first for a short period after meals but as yet there are none of the symptoms which appear in the third stage of profuse and constant glycosuria In this stage the fasting blood sugar level is above normal and hyperglycæmia and glycosuria exist *throughout* the 24 hours The patient is now a sick man as judged by his own feelings with increasing weakness, polyuria and thirst

Col McCay I M S whose magnificent work on diabetes amongst Bengalees is a landmark in the history of the study of this disease in India clearly emphasized these progressive steps which can be so clearly recognized

Further stages —The final stage is the one in which complications arise Such complications are usually infective, either through a general infection, such as

Two clinical stages in the thin type of diabetes can usually be recognized though frequently they overlap. The first stage is one of acute wasting which rapidly progresses to the second stage, ketosis, which so frequently terminates in diabetic coma, if the patient be untreated.

V. Treatment.

I will make but few remarks except for the great success with which it is attended when efficiently carried out. The treatment of the dietetic type is, in the main, by diet alone, whereas the pancreatic type usually requires insulin. The inefficiency with which treatment is usually applied is perhaps hardly to be wondered at, for it demands constant self-control on the part of the patient and constant supervision of every slightest detail by the doctor. The diabetic case sheet, as used in my wards for recording the daily progress of a diabetic case and also the blood-sugar form on which we plot the blood-sugar and urine sugar curves of each diabetic patient is shown. It will be observed in what detail these records are maintained. The result of treatment of two cases at present in my ward is also given (*see* pages 161 and 163.)

Case 73 (56).

Shanker Singh. *Hindu, 40 years, non-vegetarian, cultivator. Height,* 5 feet 7 inches. Weight, 107 lbs. Normal weight for U. P. Hindu of his age and height, 135 lbs. *Underweight,* 28 lbs. or 20 per cent. Admitted, 22nd August, 1927.

Complaints.—Polyuria, thirst, weakness, and lumbago.

Personal history.—No family history of diabetes. States that he had syphilis, and also pneumonia, 20 years ago. An abdominal scar indicates the application of counter-irritation for enlarged spleen some 10 years ago. No dietary excess but used to take *either sugar-cane or* sharbat prepared from condensed sugar-cane once daily.

Present illness.—Admitted for diabetes previously on 1st March, 1927, with a two months' history. Thirst and polyuria and weakness which commenced after 4 days' fever.

First admission.—The thirst was especially after food. He urinated 20 times a day, and after drying a white sediment was left which attracted ants. No *symptoms at* all before the fever. Spleen not palpable. W. R. complete negative. Urea concentration test, 2·7. Fasting blood-sugar, 0·35, and after 50 grammes oral glucose half-hourly, 0·41. Carbohydrate tolerance shown in the table.

Carbohydrate Tolerance

Days in Hospital	Date 1927.	Weight lbs.	Blood-sugar per cent.	Diet. C.	Diet. P.	Diet. F.	Diet. Cals.	Urine. Sp. gr.	Urine. c.c. in 24 hrs.	Urine. Daily gms. sugar per cent.	Urine. Daily gms. sugar.
5-1	5-3	107	0·35	300	63	35	1807	1012	1100	3·5	49
7	7·3	..	..	200	56	61	1519	1010	840	6	50
8	8·3	..	..	..	..	..	..	1036	1080	3	52
9	9·3	..	..	..	..	..	..	1038	690	3·5	21

this not infrequent termination of chronic diabetes by arteriosclerosis has not been sufficiently recognized or emphasized

IV SOME POINTS CONCERNING THE THIN OR PANCREATIC TYPE OF DIABETES IN INDIA

Age distribution of cases – The usual belief is that the acute thin type of diabetes is very rare in India and some have even held that it does not exist at all Such has not been my experience Indeed I have been surprised at the number of young acute thin diabetes it has been my lot to see Recently in my own ward, *out of 8 diabetics, 5 happened to be of the acute thin type* I feel sure that with extended investigation, the not infrequent occurrence of this type of diabetes will be more fully recognized

The following table sets out the distribution of my last 100 cases of diabetes. Thirty per cent of these admissions were under 30 years of age and 59 per cent were under 41

TABLE III.

Age distribution of 100 *Indian diabetics.*

Years	Under 20	21—30	31—40	41—50	51—60	Over 60
Diabetes	14	16	29	22	18	1
	Total Cases under 41 59			Total Cases over 40 41		

The cause of primary pancreatic diabetes is unknown but several thin diabetics recently under my care have dated their acute onset to an attack of fever of fairly long duration preceeding their symptoms Infections are so common in India that this may be but a coincidence More suggestive are the results of the Wassermann reaction in my last 100 cases Of my diabetics under 25 years of age, 50 per cent gave a positive reaction

TABLE IV

Wassermann reaction in diabetics of various age groups

Years	Under 25	26—45	Over 45
Positive per cent	50	31	32

Of those over 25 years approximately 32 per cent were positive The average proportion of positive Wassermann's in an unselected Indian population may be taken as approximately 22 per cent These figures point to syphilis as a possibly not infrequent cause of diabetes in the young

Shanker Singh, 40 years, crop cultivator—contd.

Day in Hospital.	Date 1927.	Weight lbs.	Blood-sugar per cent.	Daily Dietary. C.	P.	F.	Cals.	Urine. c.c. in 24 hrs.	Sugar per cent.	Daily gms. sugar.
			Insulin 20 units, once daily							
34	24/9	..	..	50	67	113	1634	796	Traces	1
35–38	25–28/9	109	..	50	67	113	1634	796	0	0
			Insulin omitted.							
			Pancreatic Rest.							
39–59	29/9–19/10	107	..	50	67	113	1634	1180	0	0
			Ladder Diets.							
60–74	20/10–3/11	110	0·14	60	67	115	1685	888	0	0
75–84	4–13/11	111	0·13	70	68	115	1736	996	0	0
85–90	14–19/11	113	0·14	80	70	115	1787	940	0	0
91–97	20–26/11	..	0·13	90	70	115	1838	908	0	0
98–99	27–28/11	113	0·14	150	85	104	1715	1140	0	0
100	29/11	..	0·18	200	85	104	1915	720	0	0

D[illegible]—First relapse in primary pancreatic diabetes.

Bl[illegible]—The three blood-sugar curves of Case 73 which follow, show the progress [illegible] under treatment in (1) the fall in the fast blood-sugar from 0·32 through 0·21 to 0·15 per [illegible] maximum height of the blood-sugar curve following 50 grammes of oral glu[illegible] 0·52 [illegible] of curve I, through 0·19 (0·10 – 0·21) of curve II to 0·14 (0·29 – 0·15) of curve III, [illegible] fall in the total amount of urinary sugar excreted (which is shown shaded beneath [illegible]) is still present after 50 grammes of oral glucose even in curve III. [illegible] than in the previous case, which is also indicated by the [illegible] curve took before reaching normal, remains in [illegible]

Carbohydrate Tolerance—contd.

Day in Hospital	Date 1927	Weight lbs	Blood sugar per cent	Diet C	Diet P	Diet F	Diet Cals	Urine Sp gr	Urine c c in 24 hrs	Urine Daily gms sugar per cent	Urine Daily gms sugar
10	10 3			100	37	80	1254	1040	1960	2 5	23
11	11							1030	840	1 0	8
12	12							1032	720	1 0	7
13 14	13–14 3							1020	840		4
15	15/3			30	5	1	150	1010	1320	0	0
16—21	16-21/3	97		52	80	95	1351	1020	750	0	0

DISCHARGED 22ND MARCH, 1927

Interval—4 months before disease he took 6 chapaties (each double the hospital chapaties) with no milk daily During interval, he took 3 chapaties and one seer of milk daily

READMITTED 22ND AUGUST, 1927

First relapse—He considered he was worse on his first admission Blood pressure, 155/80 W. R completely negative Acetone occasionally for the first month of admission, none thereafter Diacetic acid and albumen absent Urea concentration test (21/11), 2 7 per cent For carbohydrate tolerance, *see* Table

CASE 73.

Shanker Singh, 40 years, crop cultivator

Day in Hospital	Date 1927	Weight lbs	Blood sugar per cent	Daily Dietary C	Daily Dietary P	Daily Dietary F	Daily Dietary Cals	Urine c c in 24 hrs	Urine Sugar per cent	Urine Daily gms sugar
			CARBOHYDRATE TOLERANCE TEST							
3–6	24–27/8	.	.	306	76	66	2106	1800	4 6	82
7–10	28–31/8	109		200	40	72	1621	1470	4 0	60
11–25	1–15/9	108	.	100	80	132	1918	1060	1 7	19
26–33	16–23 9	105	0 23	50	67	113	1634	927	1 2	11

Case 74.

Ram Doval Lal, Hindu, 46 years, non-vegetarian, tea cultivator. Height, 5 feet 7 inches. Weight, 93 lbs. Normal weight of a U. P. Hindu of his age and height, 146 lbs. Underweight, 53 lbs. or 36 per cent. Admitted, 7th September, 1927.

Complaints.—Increased thirst, polyuria, weakness and wasting for four months.

Personal history.—No family history of diabetes. No history of infections immediately prior to onset. He has never been fond of sweets. He averaged perhaps two tolas of sugar a day. He has never had the opportunity of eating to excess. Healthy weight, 1 maund, 24 seers, or 128 lbs.

Present history.—About four months ago patient attended a feast and that very night felt intense thirst, drinking 1¼ seers of water at midnight and passing it all out some two hours later. Since that attack, the polyuria and thirst has continued. He measures his wasting by a string tied round his abdomen and assured me he had lost 3 inches in the four months. Had to get up 4 or 5 times at night to urinate.

Condition on admission.—Daily urine, 1080 c.c. Sp. gravity, 1036. Blood-pressure, 110/90. W. R., negative. No ketonuria or albuminuria. Urea concentration test (15/11), 2·0 per cent. Fasting blood-sugar, 0·40 per cent. Carbohydrate tolerance with 300 grammes of carbohydrate in the diet, 87 grammes of sugar were excreted in 24 hours. On 200 grammes, 32 grammes of sugar.

Case 74.

Ram Doval Lal, 45 years, tea cultivator.

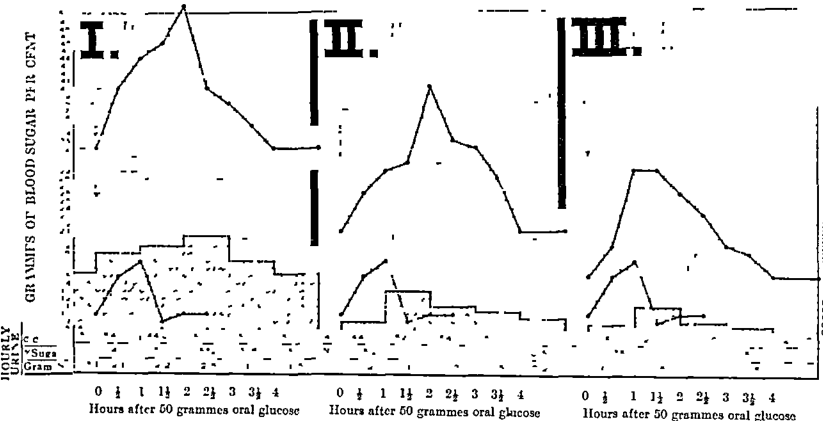
Day in Hospital.	Date 1927.	Weight lbs.	Blood-sugar per cent.	Daily Dietary.				Urine.		
				C.	P.	F.	Cals.	c.c. in 24 hrs.	Sugar per cent.	Daily grms. sugar.
				Carbohydrate Tolerance Test.						
1	8/9	..	..	306	76	66	2100	1440	6	87
2	9/9	93	0·4	..	..	..	..	1200	8	96
3	10/9	..	..	..	..	..	..	1320	6	79
4	11/9	..	..	..	..	..	..	1560	4	62
5-6	12-13/9	..	..	200	40	72	1621	1080	3	32
7	14/9	..	..	100	27	69	1143	960	2	19
8	15/9	..	..	..	..	..	..	840	1·5	13
9	16/9	..	..	..	..	..	..	480	1	5
10	17/9	..	..	..	..	..	..	440	Trace	1

KING GEORGE'S MEDICAL COLLEGL.

DEPARTMENT OF PATHOLOGY.

Physician, Major H. STOTT, I M S, Ward IV.

CASE 73 *Patient's Name, Shanker Singh, Age 40, Sex M.*



Ram Doval Lal, 45 years, tea cultivator—contd.

Day in Hospital.	Date 1927.	Weight lbs.	Blood-sugar per cent.	Daily Dietary.				Urine.		
				C.	P.	F.	Cals.	c.c. in 24 hrs.	Sugar per cent.	Daily gms. sugar.
				Pancreatic Rest.						
11–22	18–29/9	92	..	100	27	69	1143	480	0	0
				Ladder Diets.						
23–29	30/9 6/10	92	..	110	69	143	2020	480	0	0
30–38	7–15/10	93	..	120	70	143	2091	720	0	0
39–52	16–29/10	94	0·15	130	73	143	2173	740	0	0
53–65	30/10–11/11	96	0·13	140	87	159	2338	701	0	0
66–76	12–22/11	98	0·11	150	88	159	2389	521	0	0
77–80	23–26/11	..	0·11	160	78	168	2591	480	0	0
81–82	27/11	102	0·13	200	46	102	2033	480	0	0

Diagnosis.—Acute primary pancreatic diabetes without ketosis.

Progress.—Remained sugar-free on ladder diets up to 200 grammes of carbohydrate in diet. Feels much stronger, only has to get up once at night to urinate and passes only one-fifth the former total amount of urine. Digestion is much improved. Feels far happier and healthier.

Blood-sugar curves.—The three blood-sugar curves of Case 71 which follow, show in graphic form the progressive improvement under treatment in (1) the percentage of the fasting blood-sugar (0·10 to 0·12); (2) the diminution in the maximum height of the curve above the fasting sugar level, i.e., from 0·16 per cent (0·56—0·40 of curve I, through 0·13 per cent of curve II, to 0·11 per cent of curve III); (3) the shortening of the period in which the curve remains above the fast sugar level from four hours to three hours; (4) the total amount of urinary sugar excreted after the 50 grammes of oral glucose (as marked shaded beneath each curve) which, in the case of the second curve, has very markedly diminished and, in the case of the third curve, the general improvement has been so marked that no urinary sugar is excreted even after 50 grammes oral glucose.

VI. Conclusion.

I cannot conclude without a reference to the wonderful value of insulin when correctly used in those cases in which it is indicated. The gift of this extract to humanity has been perhaps the outstanding scientific achievement of the last decade. And it is seemly that in any discussion on diabetes, we should remember

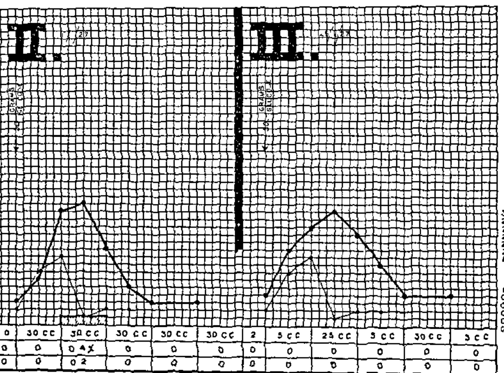
CASE 74

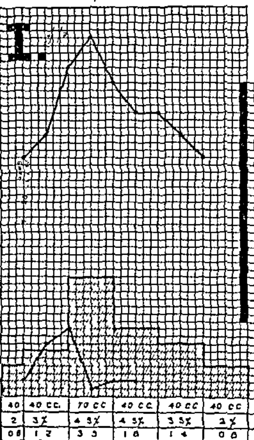
KING GEORGE'S MEDICAL COLLEGE

DEPARTMENT OF PATHOLOGY

Physician, Major H STOTT, I M S, Ward IV, Bed 2

Patient's Name Ram Doval Lal Age 45, Sex M





HOURLY URINE	I						II						III					
C.C.	40	40 cc	70 cc	40 cc	40 cc	40 cc	0	30 cc	30 cc	30 cc	30 cc	30 cc	2	5 cc	25 cc	5 cc	30 cc	5 cc
% Sugar	2	3%	4 3%	4 5%	3 5%	2%	0	0	0 4%	0	0	0	0	0	0	0	0	0
Grammes	0 8	1 2	3 3	1 8	1 4	0 8	0	0	0 2	0	0	0	0	0	0	0	0	0

DIABETES: ITS PREVENTION AND CONTROL.

BY

LIEUT.-COL. J. D. SANDES, M.D., F.R.C.P., I.M.S.,
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TYPES OF DIABETES.

THERE are two types of the disease, each in marked contrast to the other, the juvenile and the adult.

The *Juvenile type* occurs up to 20 years. The patients are thin and of nervous habit. In these cases there is an absence of the factors operative in the adult form, e.g., obesity, over-eating, alcohol and nerve strain. Acute infections form a precipitating cause. The predominant predisposing factor is heredity, and children of the type described coming of diabetic stock should be suspect. The important thing to note is that these cases are all under-weight.

The *Adult type* is in complete contrast. Early adult diabetics are practically always *fat*. Eighty per cent of all early cases are considerably *over-weight*. Joslyn's figures show that 6 to 20 per cent of adult diabetics are over-weight and that diabetes is ten times more common in these than in their counterparts below average weight. The over-weight carbohydrate feeder, especially in predisposed races, like the Bengalees, should look to his urine. Let him control his obesity and he reduces his liability to diabetes by ten times. The chief causes of obesity are over-eating, especially of carbohydrate food, and want of exercise. Sepsis should be diligently sought for and eradicated.

There is every possibility of recognizing *a pre-diabetic condition*, analogous to the pre-tuberculous condition in races in which diabetes is common We can pick out the type in which this condition is likely to be present and, by blood-sugar curves and sugar tolerance tests, determine the liability. In this way the onset of the disease may be forestalled in many cases. Diabetes occurs mainly in the educated classes and a wide publicity of the known facts would set the wise on their guard. It is a commonplace that you cannot cure a fool of his diabetes.

The next step is to separate the cases with a tendency to *ketosis* from those not so disposed. Before insulin was introduced 50 per cent of diabetics died from this cause. Gerhardt's test is easy but rough, and indicates a dangerous degree of ketosis. It also has many fallacies. Rothera's test is more delicate and has no fallacies, but indicates that ketosis is established. Earlier evidence of the

the name of Banting who, working in Canada, crowned the long series of researches by other workers with the supreme triumph of the isolation of this hormone

DIABETIC CASE SHEET

Day of Treatment	Date	Weight (Wednesdays)	Special Treatment	Daily Dietary				Blood sugar (every Wednesday)	Urine						
				in grammes of in					Daily			Every Wednesday			
				C	P	F	Cals		Sp gr	Total c c in 24 hrs	Sugar per cent	Grammes sugar in 24 hrs	Acetone	Diacetic A	Albumen
1															
2															
3															
Etc															

1 Daily dietary to be shown against the date in which it was actually consumed

2 Urine figures against any date are those for the 24 hours ending at 7 a m in the following day

Urine in ozs × 30 urine in c c

she became comatose and was rescued by insulin. Since then she has used insulin regularly. The blood-sugar in the morning is often normal but springs up after carbohydrate food, and is often again normal in 3½ hours. On a strict diet she is not so well and easily gets ketosis. Insulin has undoubtedly been of much benefit to her, but, with the sharp rise and fairly rapid fall of the blood-sugar, is capable of causing and has caused hypoglycæmic reactions. Insulin for cases of this sort is best given in small repeated doses. This, however, is very inconvenient.

This case is one of an important class, in which, when sugar is being passed, there is no ketonuria, but which is liable to get ketonuria when there is no glycosuria. The interpretation of this is that these cases can assimilate an amount of carbohydrate, sufficient to oxidize the fats completely, whereas, in the absence of carbohydrate, ketosis is very apt to appear. In these cases insulin is a two-edged sword.

Summary.

Acute diabetes is the common type in children. It is often hereditary and is very fatal. Chronic diabetes *occurs in adults who are over-weight.* These cases may be mild or severe. The mild cases can be cured by dietetic measures. Severe cases are seldom cured. Insulin is a useful auxiliary to treatment, particularly when complications are present, but is not curative. The control of the disease lies in the recognition of the pre-diabetic condition, which occurs in those who are over-weight. In the suspects, blood-sugar curves and sugar tolerance tests should be done. Increase of the normal ratio of ammonia nitrogen to total nitrogen in the urine gives the earliest indication of pending ketosis.

condition, as pointed out by Piersol, is found in an increase of the relative amount of ammonia and nitrogen to the total urinary nitrogen Thus —

$$\text{Normal Ratio} = \frac{\text{N H}_3 \text{ Nitrogen}}{\text{Total N}} \quad \frac{1}{25} = 4 \text{ per cent.}$$

An increase of this ratio should be looked upon as a danger signal which points to the onset of ketosis

Blood-Sugar Curves —The adult type of the disease is much commoner, as a rule milder, and more controllable in the Indian than in the European This is reflected in the blood sugar curves which generally deviate less from the normal in the case of the former

Renal glycosuria appears to be uncommon in the Indian, while there is quite a fair proportion of this class of case in the European

Treatment

Dietetic —In mild cases without ketosis dietetic measures, combined with the eradication of sepsis, give good results Drugs seem to have no controlling influence Raw pancreas and pancreatic extracts have not been proved of any use In the more severe cases, better results are obtained by not limiting the carbohydrates too strictly The practice of starving a patient as a preliminary to a 'ladder' diet leads to loss of flesh, which is difficult to make up and increases the tendency to ketosis The basal metabolic diet should form the starting point in severe cases If on this diet, with the carbohydrate allowance worked out according to Lawrence's formula, sugar persists in the urine, insulin should be given

Insulin is a very valuable adjunct to treatment but seldom effects a cure It is not required in mild cases and is only palliative in severe ones Its chief value is when complications are present and then it acts like a charm It is very successful in the acute diabetes of children and is often the only method of controlling the disease A word of warning is necessary *Hypoglycæmic reactions* are not uncommon, particularly in certain severe types of diabetes In this type the blood sugar behaves in an irregular way, rapidly rising after carbohydrate ingestion to a considerable height and soon falling again to nearly normal limits In these cases, hypoglycæmic reactions are prone to occur after insulin The following case in an European lady under my care illustrates the dangers of carbohydrate restrictions and hypoglycæmic reactions The diabetic condition was discovered in 1921. On a 'ladder' diet it cleared up but recurred intermittently when she went back to ordinary diet In August 1922 there was some resting hypoglycæmia, 0 212 per cent rising rapidly to 0 356 per cent at the end of an hour, and descending to 0 257 per cent at the end of an hour and a half Two hours after a glucose test meal (50 grammes of dextrose) she passed 2 6 grms of sugar in the urine Various dietetic measures were tried including pancreatic extracts. When the caloric value of her diet exceeded 1,336, sugar used to return to the urine In August 1924,

Ætiology.

The ætiology of this disease can be classified under two different heads.

1. Essential causes.
2. Predisposing causes.

Essential Causes.

The essential cause is undoubtedly infection. The infection produces damage to the pancreas, specially the islets of the Langerhan. It is very difficult to find out the nature and source of infection. The infection may be present primarily in the intestine, e.g., acute pancreatitis or the primary focus of infection may be in mouth (oral sepsis), tonsil, gastro-intestinal tract, biliary passages or in any other part of the body.

Predisposing Causes.

The predisposing causes are sedentary occupation, lack of exercise and sexual excess.

Heredity.—There are instances of heredity but cases are few (4 in 300).

Sex.—The disease is rare in females (8 in 300).

Syphilis.—I do not find any relation of diabetes to syphilis as the majority of my cases never gave a Wassermann reaction beyond 3/10 to 4/10.

Consumption of large amounts of sugar.—Some authorities on diabetes think that those Bengalees who take large amounts of sweets in addition to their ordinary diet develop diabetes. I do not agree with this statement at all because the majority of my cases scarcely touch sweets.

Labouring class.—The labouring class seems to be immune from this disease although the total amount of carbohydrates range from 600 to 650 grammes. I have had the opportunity of treating about 10,000 cases every year and during the last five years I saw only one case. The explanation is very easy.

Definition.

Diabetes is a symptom-complex associated with hyperglycæmia and passage of sugar in the urine. Many other conditions, e.g., diabetes jaundicum, renal diabetes, phloridzin diabetes, are all associated with the passage of sugar through the urine but there is no hyperglycæmia.

Glycosuria and Diabetes.

Opinions differ as to the difference between these two conditions and it is difficult to make or bring any line of demarcation between them although it is said by some that diabetes means true pancreatic diabetes glycosuria 'Diabetes that responds to diabetic treatments.'

DIABETES IN BENGAL

BY

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THE present paper is a summary of the observations made by me in connection with an enquiry into the ætiology, pathology and the treatment of diabetes started by late Kaviraj Jamini Bhusan Ray I would like to deal with the subject matter in three parts The first part deals with the history of diabetes, etiology, the principles of treatment and the value of insulin when it reaches India In my second part I would like to discuss the comparative value of the different lines of diabetic treatment by different observers The third part will include a detailed study of insulin treatment treatment of diabetes by other drugs apart from insulin and treatment of surgical diabetes

HISTORY OF DIABETES

Diabetes was known in India from ancient times In the Ayurvedic literature I find mention of 12 different kinds of diabetes Any condition that was associated with wasting and polyuria was regarded as diabetes On perusal of these 12 kinds of diabetes I notice an elaborate description of a variety which is associated with polyuria wasting and passage of an ingredient through the urine which tastes like honey (*Madhu Meha*) This seems to me a description of diabetes mellitus Our knowledge of diabetes specially with reference to pathology was scanty up to the eighteenth century In the latter part of the eighteenth century the importance of this disease was first recognized and the disease was thought to be due to a defect in the assimilation of carbohydrates In the latter part of the nineteenth century persons suffering from this disease were fed exclusively on animal diets without any decided effect and physicians in those days were quite ignorant of the fact that proteins had a carboxyl radical in their molecules In the latter part of the nineteenth century Ofric was the first person to demonstrate that the disease was *associated with defect in the internal secretion of pancreas* It was Dr Allen in America who, after his splendid researches on animals brought to the notice of the medical profession of the world the exact nature of the pathological condition of diabetes and the line of treatment to be adopted

No medicine is required except soda bicarbonate and soda citras, the latter being given to produce fine curds. The bowels must be looked after and plenty of liquids must be taken. I then increase the quantity of carbohydrate diet keeping the quantity of protein and fat constant. I prefer 'atta' as it contains less carbohydrate in comparison to rice. The addition of carbohydrate is by half a chhattack of 'atta' per week until I have added about 4 chhattacks to my diet. The total amount of calories on calculation is now found to be 2,300 and I think this is quite an adequate diet for a diabetic. The time taken was nearly 2 months. When I found the urine free from sugar and the blood-sugar nearly normal after the suggested diet, I made the following experiments:—

Instead of milk, I administered protein, 100 grammes, fat, 100 grammes in the form of butter or 'ghee'; and 100 grammes of galactose. This was continued for one week with the following results: there was no change in the urine or blood-sugar. Control experiments were also made with glucose, 100 grammes; this time the patients had hyperglycæmia and glycosuria.

Two hundred grammes of different kinds of sugar in 2 pints of water were administered to 3 healthy Bengalees, in addition to their ordinary Bengalee diet. The urine and blood were examined before ingestion and every hour after ingestion for 3 hours. The results showed that lactose and glucose increased the sugar content of blood and urine, whereas galactose produced no change. The explanation of this seems to be that the lactose, as obtained in the market, is different from milk sugar as far as the digestion of these is concerned in the gastro-intestinal tract. The lactose present in milk is hydrolyzed into galactose in the intestine and is absorbed as such. It is passed to the liver and is converted into glycogen. This glycogen seems to me to be quite different from that obtained from glucose. I should like to term the former galactose-glycogen. This galactose-glycogen after conversion is presented to the tissues in an oxidizable form.

Is galactose found in circulating blood?—No evidence has yet been obtained that it does. I performed several experiments on the hearts of frogs after subcutaneous injection and transfusion of galactose and in all cases the following results were obtained: (1) There was irregularity in the cardiac contraction. (2) There was delay in the passage of the impulse to the ventricles. (3) There were extra systoles.

Surgical Diabetes.

My observations are few. I have had the opportunity of treating a few cases and the privilege of studying 20 cases treated by my colleagues and seniors. The question is whether glucose should be withheld from the diet or be administered freely. It is difficult for me to place the details of my observations before you, but the summary is: Apart from insulin treatment there is always a rapid improvement in the surgical condition, if the urine be made sugar-free and the blood-sugar maintained at its normal. This can easily be obtained by the diet already suggested.

Normal Carbohydrate Metabolism

Carbohydrates, whatever be their nature, are all absorbed in the form of glucose, lævulose and galactose These pass into the general circulation through the liver A part of this absorbed sugar or hexose passes at once into the circulating blood and is oxidized in the tissues into CO_2 and H_2O, while the remainder is gradually converted into glycogen in the liver and heart muscles, when occasion arises this glycogen is transformed into glucose by glycogenolysis—goes into the general circulation and to the tissues for oxidation This mechanism is under the influence of the internal secretion supplying the pancreas and suprarenal gland Regarding the action of the internal secretion of pancreas, some say the pancreatic internal secretion inhibits glycogenolysis, thereby increasing the glycogen content of the liver, while others think it acts on the tissue enzyme like an amboceptor I would like to add it may be that this secretion, acting on the circulating blood sugar, changes its character making it easy for final oxidation Deficiency of this hormone would mean diminution of glycogen content of liver and consequent hyperglycæmia due to increased glycogenolysis or inability of the tissues to burn up sugar

What Happens in Diabetes?

The tissue cells are bathed in fluid containing glucose but this glucose can not be oxidized on account of the deficiency of the pancreatic hormone The ultimate effect of such a condition must be gradual concentration of the sugar in blood, finally leading to hyperglycæmia and glycosuria Sugar is present but not so in an oxidizable form consequently the fat cannot be oxidized completely in the absence of carbohydrate oxidation The ultimate result is the presence of acetone bodies in blood and urine both of which are very common in diabetes

Is the sugar present in the circulating blood different from that present in normal blood?—I conducted a series of experiments with normal and diabetic blood taking into consideration the reducibility of Benedict's solution in a given time at 100°C I also examined normal and diabetic blood through the polarimeter

Results—(i) Diabetic blood shows increased reducibility in equal con centration

(ii) The specific rotary power of diabetic blood differs slightly from that of normal blood

Effect of Intravenous Injection of Glucose in Diabetes

This pours into the circulating blood an oxidizable sugar and this sugar during oxidation helps fat to complete combustion, thereby decreasing the amount of sugar in the urine and causing complete disappearance of acetone bodies.

content of the blood was found to be on an average 0·05 to 0·052 per cent. The experiment was repeated after a fortnight but this time the dose of insulin was gradually increased. Two rabbits developed convulsions when the unit of insulin was 5, while the other two never went into convulsions until the dose was reached to 6 units.

(*iii*) Here I followed exactly the line of treatment as suggested by McLean. I gave the diet No. 1 which contained protein, 87, fat, 140 and carbohydrate, 48 grammes. The dose of insulin was given as suggested.

Day.	Morning.	Evening.
1st ..	5	5
2nd ..	5	5
3rd ..	8	5
4th ..	8	8
5th ..	8	8
6th ..	8	8
7th ..	10	8
8th ..	10	10
9th ..	10	10
10th ..	10	10
11th ..	12	10
12th ..	12	12
13th ..	12	12
14th ..	15	12
15th ..	15	15

McLean observed that if this rule is followed, the urine will be sugar-free by the sixteenth day and the blood-sugar will come to its normal level. I made 40 observations out of whom 10 per cent were suffering from diabetes. In none of my cases did I find the urine free from sugar, nor did I notice the blood-sugar normal by the sixteenth day. Much larger doses were required and the urine was never free from sugar till the twenty-first day. The only possible explanation is that the insulin had lost a part of its potency.

SOME OBSERVATIONS ON THE METABOLISM OF GALACTOSE.

Galactose belongs to the group of carbohydrates known as the hexoses. The hexose group, which is ordinarily taken as food, consists mainly of glucose, levulose.

Insulin Treatment

An enormous amount of literature has already been published with reference to the preparation advantages the amount of insulin to be administered in mild and severe cases the regulation of diet in connection with insulin therapy and the effects produced by overdose through neglect I have made hundreds of observations with insulin but cannot describe the details here for want of space Observations were made (1) with insulin in various doses in combination with 10 c cs *of diabetic blood* (2) *with rabbits to find out any difference as regards the dose* required to produce convulsions (3) to find out the effect of insulin in gradually increasing doses with McLean s special diet which consisted of 87 grammes of protein 140 grammes of fat and 48 grammes of carbohydrate (4) to find out the effect of insulin in surgical diabetes

Summary of Observations In all of my cases the following effects were seen after continuing the insulin injections for 3 to 4 weeks —(1) There was a sense of well being and comfort (2) the body weight increased from 3 to 7 lbs (3) there was no insomnia (4) acetone bodies completely disappeared from the urine (5) the effect was temporary as glycosuria re appeared as soon as the insulin was stopped (6) it produced no deleterious effects (7) in none of my cases did I notice hyperglycæmia (8) insulin acts like a specific in surgical diabetes associated with ketonuria and (9) lastly much *larger doses* are required in Calcutta the only possible explanation of this being that insulin deteriorates to some extent during its passage from America or Great Britain to Calcutta

How does Insulin act?—Whether insulin acts by forming more glycogen and preventing glycogenolysis or by increasing the oxidation in the tissues or putting the blood in an oxidizable form has yet to be worked out If we take into consideration the respiratory quotient after injection of insulin I find there is still difference of opinion

Details of Experiments

(*i*) Experiment performed with a series of diabetic bloods—In each case 10 c cs of blood whose sugar content was estimated were taken and different units of insulin ranging from 0 5 to 5 units each one with a difference of 0 5 units were added to the diabetic blood The tubes containing the insulin and diabetic blood were kept in an incubator at 40°C for two hours and then each sample was examined for its sugar content In none of the samples examined did I find any appreciable change after the addition of insulin

(*ii*) Observations in rabbits—The general rule is that 3 units of insulin injected into a rabbit weighing 300 grammes which has been starved for couple of days will reduce the blood sugar from 0·065 per cent to 0 01 per cent in 2 to 2½ hours and the animal goes into convulsions Three units of insulin were injected into two rabbits weighing from 290 to 300 grammes I did not notice any convulsions and the sugar

at 10 a.m., each was given 25 c.cs. of 5 per cent glucose and galactose respectively. Four hours afterwards, i.e., at 2 p.m., the animals were killed and their livers removed. The liver from each was thoroughly minced and treated with 500 c cs. of distilled water for 30 minutes. The liquid obtained from each was filtered and examined The filtrate was opalescent, slightly whitish, yellow in colour. Not a trace of galactose could be found in the fluid The fluid on examination was found to contain glycogen mainly, a small amount of urea and a trace of uric acid. The fluid on hydrolysis with 10 per cent HCl was found to contain :—(*a*) In the glucose experimental animal, 2·1 grammes of carbohydrate in terms of glucose (*b*) In the other, 1·63 grammes of carbohydrate in terms of glucose.

In a paper published in the *Indian Journal of Medical Research* under the heading 'Observations on Blood-sugar,' I mentioned that the administration of 200 grammes of galactose to healthy Bengalees 1½ hours after their normal meal did not raise the sugar content of the blood above normal, and that, in diabetes, galactose, after oral administration, does not raise blood-sugar but causes disappearance of acetone bodies in the urine and is tolerated well probably presenting to the tissue 'an oxidizable carbohydrate.'

Can glucose circulate in the blood as such?—In this connection, observations were made on the frog's heart with glucose and galactose in different concentrations. These experiments were conducted on my behalf by Dr. Rajendralal Kundu of the Physiological Department, Medical College, Calcutta, with the following results:—(1) There is irregularity in the nature of the cardiac contractions some stronger and some weaker. (2) There is a delay in the passage of the impulse from auricles to ventricles producing heart block. (3) Extra systoles are present, but none of these effects were ever observed after administration, orally, of large amounts of galactose (200 grammes). From these observations it was concluded that: (1) Galactose is absorbed as such. (2) The rate of absorption is much slower than that of glucose. (3) It is fermented less easily. (4) It is tolerated not only in healthy conditions, but also in diabetes. (5) It never circulates in the blood as such. (6) It presents to the tissues a carbohydrate in an oxidized form. (7) In certain conditions where glucose is prescribed to keep up the calorific requirements, and where other food-stuffs are contra-indicated, or where glucose easily undergoes fermentation, e g., in chronic gastritis, gastric cancer, gastro-enteritis, enteric fever, acute dysentery, galactose seems to be a better food.

Observations on Blood-sugar.

The observation of the sugar content of blood is so very important nowaday that without this method the treatment of diabetes would be practically impossible. The advantages of such estimations are fourfold as far as diagnosis, dietetic treatment, insulin treatment, and prognosis are concerned. After a careful review of the different methods published for the last 6 years, I have found

fructose and galactose Galactose is not commonly found in nature Its nutritive value as regards calorie ' is said to be similar to that of glucose It does not differ from glucose as regards its chemical formula but differs from the latter with reference to its specific rotatory power of polarized light the arrangement of its molecules its fermentation reactions and the osazone test Its specific rotatory power is higher as compared to glucose though it rotates the plane of polarized light to the right Fermentation observations were made with yeast and galactose respectively in different concentrations Galactose is found to take a longer time than glucose to be completely fermented the latter can roughly be said to be about one third as regards time taken for complete fermentation

Absorption — (*a*) Two rabbits of about 250 grammes were selected for observation The animals were anæsthetized with $CHCl_3$ and ether the abdomen was opened and a tight ligature was applied half an inch below the pylorus so that the contents of the stomach could not pass into intestine Into each of these animals 15 c cs of 5 per cent galactose were administered into the stomach through a catheter The rabbits were starved for 6 hours previous to these experiments The stomach was opened 4 hours after administration of galactose and the contents examined in both the animals about 98 per cent of the galactose administered could be obtained from the stomach

Control experiments —Control experiments of a similar nature were made on two rabbits of about the same weight with 5 per cent of glucose Although it is said by some authorities that glucose is not absorbed from the stomach I found 10 per cent of the glucose administered had disappeared

(*b*) In this series observations were made on 4 rabbits weighing from 250 to 270 grammes Two animals were given 25 c cs of 5 per cent galactose and the other two 25 c cs of 5 per cent glucose The animals were starved for 6 hours previous to these observations Three hours after administration the animals were anæsthetized with $CHCl_3$ and ether the abdomen carefully opened and the contents of the intestine examined The results were as follows —(*a*) Not a trace of glucose was detected from either of the animals (*b*) 0 392 gramme of galactose was still present in the small intestine (amount administered 1 25 grammes) The conclusions I drew from these observations were (*i*) Galactose is not absorbed from the stomach (*ii*) Galactose is absorbed as such from the small intestine (*iii*) The rate of absorption is slow as compared to glucose as about 33 per cent is still present 3 hours after oral administration.

What happens to galactose after absorption ?—As galactose is absorbed as such through the small intestine it must pass to liver by the way of portal vessels

Experiments —Two rabbits weighing 300 grammes were given each 1 oz of milk 1 oz of ' chana * and 1 oz of cabbage at 7 a m 3 hours after i e ,

* Chana = gram —Ed

II. In this series I estimated the blood-sugar of 4 persons suffering from glycosuria. The body-weight was not taken at the time of estimation and in each case the blood was taken in the morning.

TABLE II.

Case.	Scott. Blood-sugar per cent.	Follin. Blood-sugar per cent.	McLean. Blood-sugar per cent.
1	0·18	0·18	0·195
2	0·22	0·2	0·24
3	0·28	0·27	0·3
4	0·24	0·24	0·27

III. Here, instead of taking blood, control experiments were performed with pure glucose solution 2 per cent in a medium of 1 in 20 egg albumen solution.

TABLE III.

Scott. Blood-sugar per cent.	Follin. Blood-sugar per cent.	McLean. Blood-sugar per cent.
0·22	0·21	0·26

From an analysis of these tables it seems to me that Follin's method is the best as it gives nearly accurate results as shown by the control experiments and the time taken for the test in comparison with the others is short. As regards McLean's method, although the difference is in the place of a decimal which should not be taken seriously into consideration when the patient is under insulin, yet the result is comparatively higher. I would suggest therefore that the biochemist, in giving his report, should clearly mention the method which he employs for the estimation of the given sample of blood.

Tolerance experiments with glucose, lactose and galactose.—Innumerable experiments were conducted by Col. MacCay, I.M.S., and his associates with regard to glucose tolerance in health, in potential glucosurias, and in persons suffering from diabetes. His splendid researches have been published in the *Indian Journal of Medical Research*, and do not, I think, require any repetition. According to data obtained from Col. MacCay, I.M.S., some experiments were conducted

the methods originated by the following authors are commonly employed :— (1) Bang, (2) Benedict, (3) Mackenzie Wallis, (4) Schaeffer Scott, (5) Mill Kov, (6) McLean and (7) Follin and Wu.

Each of these methods has certain advantages and disadvantages and owing to the delicacy of the operation scrupulous care must be taken to follow in the smallest detail the technique laid down by various observers. I do not wish in this paper to discuss the various methods in detail but to my mind the best method is one which serves the following conditions :—The initial cost must be within the means of general practitioner, the current expenditure must be correspondingly slow, the apparatus can easily be replaced in case of breakage, it must require a small amount of blood, the time taken for estimation must be short and the result should be as accurate as possible. Taking into consideration the above facts I think that Follin's, Schaeffer Scott's and McLean's methods are the three best. For the treatment of any particular patient it does not matter much if one follows strictly the same method, but if two different methods are employed by two different observers for a particular case there is every chance of obtaining some slight differences. In order to find out if there be any small differences in these three methods I made a few observations which are given in the following tables. In some cases I had my results corroborated by two independent observers.

I. Ten healthy Bengalees were selected. The diet was the average Bengalee diet and the average height and weight were 5′ 5″ and 145 lbs. respectively. Blood was taken for two consecutive days half an hour after the midday meal.

TABLE I

Average results

Case	Scott Blood sugar per cent	Follin Blood sugar per cent	McLean Blood sugar per cent
1	0·09	0·085	0·09
2	0·1	0·1	0·11
3	0·085	0·09	0·1
4	0·11	0·1	0·1
5	0·095	0·09	0·11
6	0·1	0·095	0·11
7	0·11	0·1	0·12
8	0·12	0·11	0·135
9	0·095	0·095	0·115
10	0·1	0·1	0·125

V. Here the experiment was performed on one patient only. He was a potential glycosuric and his carbohydrate tolerance was found to be 200 grammes. He was given 50 grammes of sugar each time one and a half hours after his tolerance diet. Before ingestion his blood-sugar was 0·13 per cent and his urine showed a trace to Benedict's test. The result obtained was as follows :—

TABLE V.

Sugar in Blood.

	Before ingestion Per cent.	Blood-sugar after ingestion. Per cent. 1st hour	2nd hour.	3rd hour.
Glucose ..	0·13	0·15	0·165	0·14
Lactose ..	..	0·18	0·19	0·175
Galactose ..	..	0·13	0·135	0·135

Sugar in Urine.

1st Observation	Glucose ..	*Nil*	0·25	0·4	0·2
	Lactose ..	*Nil*	0·7	0·9	0·6
	Galactose ..	*Nil*	*Nil*	*Nil*	*Nil*
2nd Observation	Glucose ..	*Nil*	*Nil*	A trace to Benedict.	*Nil*
	Lactose ..	*Nil*	1	1·2	0·6
	Galactose ..	*Nil*	*Nil*	*Nil*	*Nil*

VI. Here the experiments were performed on a diabetic patient. He was passing 2,000 c.cs. of urine in 24 hours and, on an average, the urine showed 5 per cent of sugar. The blood-sugar was determined on three occasions and found to be 0·37 per cent. The total amount of sugar excreted was 100 grammes in 24 hours. The diet as prescribed by me contained 130 grammes of carbohydrates. It is quite apparent, therefore, that the patient had a tolerance of 30 grammes of carbohydrate only. He was a sub-judge and, being well educated, strictly followed the diet [illegible] for the experiments. For 3 consecutive days he was given 130 grammes of galactose, 10 grammes of protein in the form of eggs and fish and 20 grammes of carbohydrate in the form of vegetables in the 24 hours. The urine, though collected, could not be relied on as the patient through mistake, forgot to collect his urine [illegible] before going to stool.

by the present writer with special reference to the relative excretion in the urine and the variations in the blood sugar, after ingestion of glucose, lactose and galactose in the same patient In each case special precautions were taken to ensure that the intake of food remained the same and the body weight also The methods selected were *the Schaeffer and Scott methods for blood-sugar*, while the urine was examined by Fehling's and Benedict's methods Each person was given the different forms of sugar after an interval of 3 days

IV Here two Bengalee students of good physique were selected for observation, average weight, 164 lbs , height, 5′ 5½ The blood contained an average of 1 per cent of sugar and the urine no sugar before the injection The average diet taken by the students was the diet ordinarily taken by the Bengalee student community in general The articles of food are mentioned below with the amount per item —

	Chhattacks.	
Rice .	7	in 24 hours
Fish .	2	
Vegetable .	4	
Milk .	6	
Dal	1	
Sweets, etc , including Luchi, Shingara, Kachuri and Potato	4	

The total amount of carbohydrate calculated from the above diet amounted to about 100 grammes which, in my opinion, is not a rich carbohydrate diet, as some authorities might think, taking into consideration the hard labour they have to undergo in the prosecution of their studies Two hundred grammes of sugar in 1 pint of water were administered at 8 a m and the result obtained with regard to the blood sugar was as follows —

TABLE IV

	Blood sugar before ingestion Per cent	Blood-sugar after ingestion Per cent		
		1st hour	2nd hour	3rd hour
Glucose	0 1	0 11	0·125	0·11
Lactose	0 1	0 17	0 185	0 175
Galactose	0 1	0 1	0·11	0·1

APPENDIX A—*contd.*

Carbohydrates from 0·5 to 5 per cent—contd.

Name	Water. Per cent	Protein. Per cent.	Fat. Per cent	Carbo-hydrate. Per cent.	Cellulose Per cent.	Mineral. Per cent	Amount of carbo-hydrate in 1 oz. Per cent.
9. Kanch Kala (Green plantain).	88·61	0·5	0·2	3·3	..	..	1
10. Puinshak	86	1·47	Trace	Trace	..	..	Trace
11. Notaishak	91·4	0·63	*Nil*	Trace	..	..	Trace
12. Palang Shak (Spinach) ..	92·07	0·6	*Nil*	Trace	..	..	Trace
13. Papaw (Raw) ..	87·46	0·56	Trace	3·47	..	..	1·14
14. Moola (Raddish) ..	93·65	0·63	Trace	1·8	..	..	0·05
15. Cauliflower	91·5	1·44	0·6	2·92	..	..	0·88
16. Do. big	91	1·98	0·62	3·17	..	..	0·91
17. Cabbage (ad) ..	88	0·69	Trace	2·5	..	..	2·5
18. Do. (seasoned) ..	87·6	1·24	Trace	3·29	..	..	0·98
19. Sheem (Lentils) ..	83	1·25	0·3	1·3	..	..	0·01
20. Chalkumra (Green pumpkin).	90	0·18	Trace	2·3	..	..	0·69
21. Kumra (Pumpkin, English)	88	0·25	Trace	3·87	..	..	1·16
22. Patol	..	0·72	0·38	1·21	..	..	4·06

Carbohydrates from 5 per cent to 10 per cent.

Name	Water. Per cent	Protein. Per cent.	Fat. Per cent	Carbo-hydrate. Per cent.	Cellulose Per cent.	Mineral. Per cent	Amount of carbo-hydrate in 1 oz. Per cent.
1. Quaker Oats ..	91·4	1·65	0·32	6·21	0·09	..	1·87
2. French Beans ..	89·5	1·5	0·4	7·3	0·6	..	2·19
3. Carrots	85·7	0·5	0·3	10·1	1·5	..	3·03
4. Onions	89·1	1·6	0·3	6·3	2	..	1·89
5. Lemons	..	1	0·7	8·5	..	..	2·57
6. Peaches	..	0·7	0·1	9·4	..	..	2·82
7. Pineapple (Singapore) ..	..	0·4	0·3	9·7	..	..	2·91
8. Brazil Nut	..	17	66·8	7	..	..	2·1
9. Beech Nut	..	13	31	7·8	..	..	2·34
10. [illegible] ..	..	1·25	0·57	7·25	0·96	..	2·17
11. [illegible]	..	[illegible]	*Nil*	6·6	*Nil*	..	[illegible]
12. [illegible] ..	..	[illegible]	*Nil*	6·5	*Nil*	..	[illegible]
13. [illegible] ..	..	[illegible]	Trace	7·25	[illegible]	..	2·17

TABLE VI.

	On 2nd day Per cent	3rd day Per cent	4th day Per cent
Blood sugar	0·28	0·24	0·2
Urine sugar	3·8	2	1·25

The following is a summary of the results obtained :—The carbohydrates which are ingested are either in the form of mono-saccharids di-saccharids or poly saccharids Whatever may be their nature however they are absorbed in the form of glucose, *lævulose or galactose*

In diabetes the cells are bathed in a medium of glucose which is not in an oxidizable form (I am not discussing under what circumstances the glucose in diabetes remains in a non-oxidizable form) From an analysis of the results in sections IV V and VI it is quite clear that galactose is not only tolerated in healthy persons and potential diabetics without any rise of blood sugar and passage of sugar in the urine, but even in diabetics it is absorbed into the blood in an oxidizable form as will be evident from the reduction in the percentage of blood sugar and sugar in the urine I am conducting further experiments on this line according to Winter and Smith and the results will be published in due course

APPENDIX A

FOOD STUFFS CONTAINING

Carbohydrates from 0·5 to 5 per cent.

	Name	Water Per cent	Protein Per cent	Fat Per cent	Carbo hydrate Per cent	Cellulose Per cent	Mineral Per cent	Amount of carbo hydrate in 1 oz Per cent
1	Asparagus	91·7	2·2	0·2	2·9	2·1	0·9	0·8[illegible]
2	Tomato	91·9	1·3	0·2	0·1	1·5	0·76	Trace
3	Spinach	90·6	2·5	0·5	3·8	0·9	1·7	1·11
4	Turnips	90·3	0·9	0·15	3·4	1·8	0·14	1·02
5	Milk	87	3	3·5	4		0·7	1·2
		88	3·5	4·5	5		0·75	1·[illegible]
6	Brinjal	91·9	0·61	0·2	1·9	4·8		1·44
7	Uchey	93·5	0·35	0·2	0·5	4·43		Trace
8	Jhinga (Loofah)	91·5	0·37	0·1	0·5			Trace

APPENDIX A—*concld.*

Carbohydrates from 40 per cent to 60 per cent.

Name.		Water. Per cent	Protein. Per cent.	Fat. Per cent.	Carbo-hydrate. Per cent.	Cellulose. Per cent.	Mineral. Per cent.	Amount of carbo-hydrate in 1 oz Per cent
1.	Oat	10	10·9	4·5	59·1	12·6	3·5	17·73
2.	Bread	40	6·5 to 9	1·2	52·2	0·3	1·2	15·66
3.	Chestnut	..	6·2	5·4	42	..	..	12·6
4.	Mung Dal	..	23·62	2·69	53·45	4·1	..	16·03
5.	Mussur Dal	..	25·47	3	55·03	2·94	..	16·5
6.	Gram Dal	..	19·94	4·31	51·13	10·83	..	15·33
7.	Motor Dal (Dried Peas) ..	..	22·01	1·96	53·97	7·5	..	16·19
8.	Kalai Dal or Urad Dal ..	..	22·58	1·1	58·02	3·82	..	17·4
9.	Arhar Dal	..	21·67	3·33	54·27	5·15	..	16·28

Carbohydrates from 60 per cent to 80 per cent.

Name.		Water. Per cent	Protein. Per cent.	Fat. Per cent.	Carbo-hydrate. Per cent.	Cellulose. Per cent.	Mineral. Per cent.	Amount of carbo-hydrate in 1 oz Per cent
1.	Hulled Oat	6·9	13	8·1	68·6	1·3—0·21	..	20·58
2.	Maize	12·5	9·7	5·4	68·9	2·6—1·5	..	20·67
3.	Oatmeal	7·2	14·2	7·3	65·9	3·5—1·9	..	20·77
4.	Rolled Oats	7·2	15·4	7·2	64·8	3·5—1·9	..	19·44
5.	Pearl Barley ..	12	1·4	1·2	76·7	0·08—0·2	..	23·01
6.	Rice (Best quality, country)	..	6·35	0·8	78·8	*Nil*	..	23·64
7.	Wheat Atta (Best) ..	..	13·4	2·4	67	Trace	..	20·1
8.	Makki Atta	..	9·7	2·3	66·2	5·66	..	19·86
9.	Jawar Atta	..	7·64	2·32	68·23	7·28	..	20·46
10.	Barley Gram ..	..	7·98	1·76	76·38	3·8	..	22·91
11.	Bajra Atta	..	7·26	1·86	71·47	5·34	..	21·44
12.	[illegible] Rice ..	..	10·06	1·08	76·24	*Nil*	..	22·87
13.	Red Wheat ..	..	8·75	1·24	75·73	1·96	..	22·71
14.	[illegible]	..	9·06	1·04	72·18	3·36	..	21·74

Carbohydrates from 80 per cent.

Name.		Water. Per cent	Protein. Per cent.	Fat. Per cent.	Carbo-hydrate. Per cent.	Cellulose. Per cent.	Mineral. Per cent.	Amount of carbo-hydrate in 1 oz Per cent
1.	[illegible]	10·1	5·13	0·067	84·87	1·03	..	25·5
2.	[illegible]	10·1	6·2	0·9	82·8	0·6	..	[illegible]

APPENDIX A—*contd*

Carbohydrates from 10 per cent to 20 per cent

	Name	Water Per cent	Protein Per cent	Fat Per cent	Carbo hydrate Per cent	Cellulose Per cent	Mineral Per cent	Amount of carbo hydrat in 1 oz Per cent
1	Biscuit	7·45	7·2	9·2	17·2	0·16		5·16
2	Apricots	*Nil*	1	*Nil*	13·4			4·02
3	Pears		1	*Nil*	14·1			4·23
4	Apples		4	0·5	14·2			4·26
5	Figs		1·5	*Nil*	18·8			5·64
6	Grapes		1·5	1·6	19·2			5·76
7	Walnuts		16	63	16			4·8
8	Almonds		21	54·9	17·3			5·19
9	*Apples (Kulu)*		0·62	0·46	16·78	2·44		5·03
10	Apples (ordinary)		0·44	Trace	12·24	4·28		3·67
11	Oranges (Sylhet)		0·82	Trace	11·66	2·21		3·49
12	Plums		0·98	Trace	16·27	3·98		4·88
13	Plums (country)		0·34	Trace	13·82	4·46		4·14
14	Cocoanut (ripe)		3·87	56·28	20·28	4·2		6·08
15	Potato (Bombay variety)		1·65	0·57	14·6	8·44		4·38
16	Potato (best kind)		1·87	0·62	19·88	9·37		5·96
17	Goorikachu		1·12	0·2	19·23	3·75		5·76
18	Chubri Alu (Potato small)		0·98	Trace	16·1	9·61		4·83
19	Mankachu		0·25	Trace	11·2	3·01		3·36

Carbohydrates from 20 per cent to 40 per cent

	Name	Water Per cent	Protein Per cent	Fat Per cent	Carbo hydrate Per cent	Cellulose Per cent	Mineral Per cent	Amount of carbo hydrat in 1 oz Per cent
1	Soyo Beans	11	32·9	18·1	28·7	4·4	4·0	8·61
2	Bananas		1·3	0·5	22			6·6
3	Peats Nuts		25	38	24			7·2
4	Cocoanut		6·3	57	31			9·3
5	Kantal Bichi (Seeds of Jack fruit)		13·11	1·98	34·8	1·65		10·44
6	Motor Suti (*Peas*)		8·37	0·87	22·43	5·52		6·72
7	Ranga Alu		1·57	0·32	22·5	13·22		6·75
8	Sanka Alu		1·54	0·29	21	3·29		6·3

APPENDIX A—*concld.*

Carbohydrates from 40 per cent to 60 per cent.

Name.	Water. Per cent.	Protein. Per cent.	Fat. Per cent.	Carbo-hydrate. Per cent.	Cellulose. Per cent.	Mineral. Per cent.	Amount of carbo-hydrate in 1 oz. Per cent
1. Oat	10	10·9	4·5	59·1	12·6	3·5	17·73
2. Bread	40	6·5 to 9	1·2	52·2	0·3	1·2	15·66
3. Chestnut	..	6·2	5·4	42	..	..	12·6
4. Mung Dal	..	23·62	2·69	53·45	4·1	..	16·03
5. Mussur Dal	..	25·47	3	55·03	2·94	..	16·5
6. Gram Dal	..	19·94	4·31	51·13	10·83	..	15·33
7. Motor Dal (Dried Peas) ..	..	22·01	1·96	53·97	7·5	..	16·19
8. Kalai Dal or Urad Dal ..	..	22·58	1·1	58·02	3·82	..	17·4
9. Arhar Dal	..	21·67	3·33	54·27	5·15	..	16·28

Carbohydrates from 60 per cent to 80 per cent.

Name.	Water. Per cent.	Protein. Per cent.	Fat. Per cent.	Carbo-hydrate. Per cent.	Cellulose. Per cent.	Mineral. Per cent.	Amount of carbo-hydrate in 1 oz. Per cent
1. Hulled Oat	6·9	13	8·1	68·6	1·3—0·21	..	20·58
2. Maize	12·5	9·7	5·4	68·9	2·6—1·5	..	20·67
3. Oatmeal	7·2	14·2	7·3	65·9	3·5—1·9	..	20·77
4. Rolled Oats	7·2	15·4	7·2	64·8	3·5—1·9	..	19·44
5. Pearl Barley ..	12	1·4	1·2	76·7	0·08—0·2	..	23·01
6. Rice (Best quality, country)	..	6·35	0·8	78·8	*Nil*	..	23·64
7. Wheat Atta (Best) ..	..	13·4	2·4	67	Trace	..	20·1
8. Makki Atta	..	9·7	2·3	66·2	5·66	..	19·86
9. Jawar Atta	..	7·64	2·32	68·23	7·28	..	20·46
10. Barley Grain ..	..	7·98	1·76	76·38	3·8	..	22·91
11. Bajra Atta	..	7·26	1·86	71·47	5·34	..	21·44
12. Darbhanga Rice ..	..	10·06	1·08	76·24	*Nil*	..	22·87
13. Buck Wheat ..	..	8·75	1·24	75·73	1·96	..	22·71
14. Makna	..	9·06	1·04	72·48	3·36	..	21·74

Carbohydrates from 80 per cent.

Name.	Water. Per cent.	Protein. Per cent.	Fat. Per cent.	Carbo-hydrate. Per cent.	Cellulose. Per cent.	Mineral. Per cent.	Amount of carbo-hydrate in 1 oz. Per cent
1. Barley	10·1	5·13	0·097	81·87	1·93	..	24·56
2. Rice	10·1	6·2	0·9	82·8	0·6	..	..

APPENDIX B

COMPOSITION OF CERTAIN OTHER ARTICLES OF FOOD

Names	Protein	Fat	Ash
Mutton (lean)	17 2	1 6	0 9
Do (with fat)	13 5	15 2	0 9
Beef 1st Class	19	4 5	1 5
Beef 2nd Class	18 6	1 1	1 5
Goat 1st Class	17 2	10 2	0 7
Fowl	18 6	6 8	0 9
Chhana (Curd)	3 6	3 3	
Butter		82	
Skimmed Milk	Contains fat one third of normal		
Cream	8 6	5 7	
Eggs Indian	10 2	10 5	
{ White	12 6	25	
{ Yolk	16 2	31 75	

Molasses —Prepared by concentrating juice of sugar cane, juice of date palm or cane sugar, when the consistency is syrupy a small amount of cane sugar is added and allowed to cool suddenly

(1) 'Tal Gur'—Prepared from the juice of date palm

Consistency	Syrupy
Lævulose	22 7 per cent
Cane sugar	68 9 ,, ,,
Water of crystallization	8 4 ,, ,,
Total carbohydrate	98 6 ,, ,,

(2) 'Khejur Gur'—Prepared from the juice of date trees

Consistency	Solid
Lævulose	1 45 per cent
Water of crystallization	3 8 ,, ,,
Total carbohydrate	96 2 ,, ,,

(3) 'Akha Gur'—Prepared from the juice of sugar cane

Consistency	Semi solid
Lævulose	25 per cent
Cane sugar	35 ,, ,,
Water	13 ,, ,,
Total carbohydrate	60 ,, ,,

APPENDIX B—*contd.*

(1) 'Bheli Gur'—Prepared from juice of sugar-cane.

Consistency	Solid.
Lævulose	15 per cent.
Cane sugar	84·8 „ „
Water	4·23 „ „
Total carbohydrate	95·8 „ „

(5) 'Tal Misri'—Prepared from the juice of date palm, to which is added a small quantity of hydrochloric acid. The solution is boiled and to it is added a small amount of alcohol (absolute) and cooled suddenly to allow crystallization. The crystallized product is then allowed to dry in open air and is named 'misri.'

Reaction of the solution	Acid to litmus.
Lævulose	A trace.
Cane sugar	96·6 per cent.
Water of crystallization	3·4 „ „
Total carbohydrate	96·6 „ „

(6) 'Thala Misri'—Method of preparation same as 'Tal Misri,' the only difference being that the solution is allowed to cool in a flat dish and not dried in the open air.

Reaction	Acid.
Glucose	A trace.
Cane sugar	82 per cent.
Water	18 „ „
Total carbohydrate	82 „ „

(7) 'Kud Misri'—Prepared from the juice of sugar-cane. The method of preparation is the same as with 'Tal Misri,' the only difference is that the solution is more concentrated before it is allowed to crystallize.

Reaction	Slightly acid.
Glucose	A trace.
Cane sugar	96·4 per cent.
Water	3·6 „ „
Total carbohydrate	96·4 „ „

(8) 'Sada Chini'—This is pure Java sugar.

Colour	White crystals.
Sugar (reduceable)	*Nil*
Cane sugar	97·2 per cent.
Water of crystallization	2·8 „ „
Total carbohydrate	94·2 „ „

APPENDIX B

Composition of certain other articles of food

Names	Protein	Fat	Ash
Mutton (lean)	17·2	4·6	0·9
Do (with fat)	13·5	15·2	0·9
Beef, 1st Class	19	4·5	1·5
Beef 2nd Class	18·6	4·1	1·5
Goat, 1st Class	17·2	10·2	0·7
Fowl	18·6	6·8	0·9
Chhana (Curd)	3·6	3·3	
Butter		82	
Skimmed Milk	Contains fat one third of normal		
Cream	8·6	5·7	
Eggs Indian	10·2	10·5	
{ White	12·6	25	
{ Yolk	16·2	31·75	

Molasses—Prepared by concentrating juice of sugar cane, juice of date palm or cane sugar, when the consistency is syrupy a small amount of cane sugar is added and allowed to cool suddenly

(1) 'Tal Gur'—Prepared from the juice of date palm

Consistency	Syrupy
Lævulose	22·7 per cent
Cane sugar	68·9 ,, ,,
Water of crystallization	8·4 ,, ,,
Total carbohydrate	98·6 ,, ,,

(2) 'Khejur Gur'—Prepared from the juice of date trees

Consistency	Solid
Lævulose	1·45 per cent
Water of crystallization	3·8 ,, ,,
Total carbohydrate	96·2 ,, ,,

(3) 'Akh Gur'—Prepared from the juice of sugar cane

Consistency .	Semi solid
Lævulose .	25 per cent
Cane sugar	35 ,, ,,
Water	43 ,, ,,
Total carbohydrate . .	60 ,, ,,

the face of any or all of these complications and it is here, where severe acetonæmia or else severe failure of metabolism is indicated, that I have found that something like heroic doses of insulin, e.g., 50 to 100 units are required (administered subcutaneously or, for rapid action, intramuscularly with close vigilance for hypoglycæmia, to be combated with glucose given orally or a small injection of adrenalin chloride). This procedure will avert an otherwise inevitable catastrophe. I systematically practise this method in the above-mentioned condition of what may be termed a total-metabolic-failure-syndrome with success, being guided by blood-sugar estimations at frequent intervals.

DISCUSSION.

Lieut.-Col. C. A. Sprawson, I.M.S. (United Provinces): Dealt with a few practical clinical points in connection with the coexistence of diabetes with other constitutional conditions, such as albuminuria, syphilis and tuberculosis and the relative amount of regard that should be paid to each of the coexistent diseases when their respective indications for treatment, dietetic or medicinal, appeared to clash.

Dr. V. Krishna Menon (Madras): Major Stott in his interesting paper remarked that in the investigations made, it was found that the Wassermann reaction was positive in about 50 per cent of cases among the middle-aged, and that probably syphilis was one of the potent causes of diabetes. I would like to know from Major Stott if he has carried out anti-syphilitic treatment, such as arsenical preparations intravenously, and if so, what the result of his investigation was on that particular kind of case. Are there any contra-indications to the use of intravenous injections of the neosalvarsan or other similar preparations in diabetic cases, as it is said by certain clinicians that diabetes is a contra-indication for such injections? I should be much obliged for his observations on this matter.

Dr. Dhanjibhai H. Mehta (Baroda State, B. India): In the treatment of diabetes one ounce of the powdered leaves of *Gymnema sylvestre* (called *Vakhandi* or *Bidkuli* in Marathi, and *Shiru Kuranja* in Sanskrit) boiled with four cupfuls of water down to three cupfuls and one cupful taken thrice a day, is said to bring down the specific gravity within 48 hours by about 6 to 8 degrees. After the leaf is chewed, one is not able to taste the sweetness of sugar or the bitterness of quinine. This is the test for finding out the true drug.

Major S. S. Sokhey, I.M.S. (Bombay): Major Stott's finding of a positive Wassermann in 50 per cent of his cases, and of the presence of albuminuria leading to uræmia in a large number, shows, in my opinion, that he has not been discussing diabetes but a conglomeration of conditions in which glycosuria and hyperglycæmia were present. Joslin's analysis of his large series of cases has shown that syphilis is not an ætiological factor, and the same is true of affections of the kidney. This inability to differentiate true diabetes from other conditions, I am afraid, has led to Lieut.-Col. Sandes getting poor results with modern diabetic treatment. Such treatment has been designed to correct metabolic disturbances due to defective internal secretion of the pancreas, i.e., true diabetes, and naturally cannot be expected to give good results

APPENDIX B—*concld*

(9) 'Lal Dobara Chini'—This is the crude form of cane sugar prepared from the juice of sugar cane This solution is not crystallized

Colour .	Yellow and brown amorphous
Glucose	A trace
Cane sugar	72 per cent
Water	28 ,, ,,
Total carbohydrate	72 ,, ,,

(10) 'Bata Chini'—A crude form of cane sugar not crystallized prepared from the juice of sugar cane The juice is boiled to a syrupy consistency and the syrup is rubbed in the open air

Colour .	Yellowish
Glucose .	6 4 per cent
Cane sugar	89 9 ,, ,,
Water of crystallization . .	3 6 ,, ,,
Total carbohydrate	96 3 ,, ,,

(11) 'Kashi Chini'—Prepared mostly in Benares and Central Provinces It is partly amorphous and partly crystallized

Colour	Pinkish white
Glucose .. .	5 2 per cent.
Cane sugar .	91 2 ,, ,
Water ..	3 6 ,, ,,
Total carbohydrate	90 4 ,

APPENDIX C

ANALYSIS OF SOME OF THE VEGETABLES AND CEREALS COMMONLY USED IN BENGAL NOT ESTIMATED BEFORE

Vegetables	Protein	Carbohydrate	Fat	Cellulose	Water
Makna	12 5	52 6	4 8	*Nil*	30·1
Green Peas	11 3	12 6	1 2	4 5	70 4
Chichinga	3 2	7 6	*Nil*	5 7	83 5

the positive Wassermann is found in the earlier ages, the prognosis is worse, for here the cause may be a congenital interstitial pancreatitis comparable to a congenital interstitial hepatitis from hereditary syphilis. With regard to the queries concerning the use of indigenous drugs, I fully agree with Dr. Bose. We have tried out several such drugs under strict scientific tests in Lucknow, and in no case have we found that any drug, except of course insulin (if indeed it can be regarded as a drug), has the least effect in lowering the blood-sugar or indeed in reducing the grammes of sugar excreted in the urine per day.

when the condition does not happen to be diabetes or is much more than diabetes Joslin talking of the modern treatment of diabetes which consists of a diabetic regime helped by insulin, if need be, says that those, in whom diabetes is detected early and are put under proper treatment, enjoy better health for ever than non diabetics who, as a rule overeat themselves to ill health I regret I must also disagree with Major Stott as to the severity of the condition in Indians My own experience is that the condition is distinctly milder in its manifestations This, I believe, is due to the low protein intake of the Indian In a large series of normals I found the total nitrogen excretion to be between 5 and 7 grammes per day

Dr J P Bose (Bengal) Replying to Dr Mehta regarding the efficacy of *Gymnema sylvestre*, I have tried this drug on diabetic patients without any result whatsoever The alkaloid extracted from the plant had similarly no action on the blood-sugar of rabbits

With reference to Major Stott's remarks regarding syphilis being an important predisposing cause of diabetes, I can say that only 2 per cent of my cases had a positive Wassermann reaction and these were all between 20 and 30 years of age

Regarding Col Sprawson's remarks that we seldom get any cases of true diabetic coma here, but what we get is uræmic coma, I accept this statement with only a slight modification because I have had five or six cases of true diabetic coma in whom the kidneys were found to be in a perfectly normal condition judging from the renal function tests and the estimation of U P N urea and other constituents in the blood

Major H Stott, I M S (United Provinces) replied Lieut Col Sandes' warning remarks on the unimportance of some forms of glycosuria are important It will, however, be recognized that such forms are transient in nature and mild in degree and are due to some temporary endocrine upset But if glycosuria has persisted over a long period, even if only intermittent, and, if the cause of such temporary endocrine upset is found to be absent, then such glycosuria will almost invariably be of the diabetic type and will shorten life if not properly regarded

Concerning Col Sprawson's remarks on the treatment of diabetes complicated with albuminuria, with syphilis and with tuberculosis, I agree that in each case both conditions should, as far as possible be treated, and certainly, in albuminuria and tuberculosis, the anti diabetic treatment should be thorough, since diabetes is the primary factor to be held responsible for the development of the kidney and of the lung condition

We all regret that it was not possible to hear the whole of Dr Dutt's paper owing to want of time since, in collaboration with McCay, he undertook so much of the original work on diabetes in Bengal

There is a marked difference in the proportion of positive Wassermann reactions found in his cases and in mine which only future experience can decide As Major Sokhey rightly points out syphilis and diabetes are two distinct diseases If syphilis is detected in an elderly diabetic, both conditions should be treated and diabetes is no contra indication to the administration of salvarsan Sometimes, perhaps, the anti syphilitic treatment will of itself, as in Col Sprawson's case, abolish the specific toxins and permit of functional recovery of the islet cells When, however,

even in India, who, on account of the present teaching at some of the British medical schools, are reluctant to take up litholapaxy. This teaching is diametrically opposed to the experience and practice of the leading stone surgeons in India, and no apology therefore seems to be needed in bringing the question to the notice of the first Congress of the Far Eastern Association of Tropical Medicine to meet in India. If the present trend of teaching in England and America is of a retrograde character in this respect, as we out here think, it is very desirable that the arguments in favour of litholapaxy should be authoritatively restated, and a full discussion of the question at this Congress would be of great value.

Thirty years ago my old chief, Mr. F. A. Southam, was using lithotrites successfully in the Manchester Royal Infirmary, and there was no doubt in those days, so far as I remember, as to litholapaxy being the operation of choice for stone-in-the-bladder. The chief arguments now brought against it appear to be that suprapubic lithotomy can be done with nearly as great safety, that litholapaxy is difficult to learn and dangerous when performed by inexperienced operators, and that there are more recurrences after it than after lithotomy.

A statistical comparison of the results of the two operations is hardly possible in India, where for the most part only the bad cases are dealt with by the cutting operation, and I have never seen an effective comparison of British figures, which might presumably be obtainable. The impression is widely prevalent in India, however, that litholapaxy in skilled hands is much the less dangerous operation, and our figures speak for themselves, and still more emphatically if it is admitted, as most of us contend, that contrary to the impression at home, our cases on the average are less promising than those which come to the English hospitals. We have a considerable proportion of large stones and septic bladders to deal with, and we consider, moreover, that the idea which seems to prevail at home that Indian patients in general bear operation better than Europeans is entirely erroneous. It remains to be said that suprapubic lithotomy is not without its dangers. A very little disturbance of the cave of Retzius may lead to disastrous consequences.

The frequency of recurrence after litholapaxy is much exaggerated. Under proper conditions recurrences should be very rare Experience of my own and other people's work is that they are quite infrequent, though it is unfortunately impossible to put up figures in proof of this statement. A fair test of the general result of the operation is its reputation with the public. The Indian cultivator, who furnishes the great majority of our up-country patients, is an acute judge of the practical results of surgery, as shown, for instance, in his appreciation of the modern operations for hernia. As regards litholapaxy he made up his mind long ago, and there is no surer way of emptying one's hospital of stone cases than by reverting to a cutting operation where crushing has formerly been in vogue. There is not only the escape from the knife but the early discharge from hospital to be considered, and it is, of course, quite common for children who have been relieved of small stones by the lithotrite in the morning to be running about in the afternoon. It is, I think one may say, the opinion of an overwhelming majority of Indian

SURGERY.

THE CHOICE OF OPERATION FOR VESICAL CALCULUS.

BY

MAJOR-GENERAL A HOOTON, C I E., K H P., I M S,

Officiating Director General, Indian Medical Service, Delhi.

AT the Congress of the Far Eastern Association of Tropical Medicine which Mon
was held at Manila in 1910, I had the honour of attending as delegate for India, Dec
and if there are any gentlemen present here to day who were at that meeting they 11 A
may possibly recollect that I read a paper on litholapaxy It is, therefore, with a 1 P
certain amount of diffidence that I revert to the same subject to-day, but I am encouraged to do so by several circumstances In the first place, any one who was present at Manila will almost certainly have forgotten all about my small contribution on that occasion Then my 1910 paper dealt only with the subject of perineal litholapaxy, whereas at present we are concerned with the treatment of vesical calculus generally, and there are also special reasons why the question may be regarded as pressing now. Finally, stone-in the-bladder is a very important subject in India Many Indian surgeons have had unrivalled experience of the various operations which have, at one time or another, held sway, and much has been written with regard to them Although the operation of litholapaxy was first put on a sound working basis by an American surgeon, several members of the Indian Medical Service have been responsible for modifications in it, and more specially for its adaptation and extension to children Long series of cases have been published, and the results quoted have been so satisfactory that in India litholapaxy has been considered thoroughly established for many years past, as the procedure of election in all but a few exceptional cases, and, if it had not been for a marked change in teaching and practice with regard to stone surgery outside India, the subject might have been dismissed as too trite for discussion at this Congress

But for a considerable period there appears to have been a gradual tendency to substitute suprapubic lithotomy for litholapaxy, both in Europe and America, and in a well-known textbook, published as far back as 1914, it is even stated that 'litholapaxy is not now in general use.' This may be an extreme view, but there is abundant evidence to show that the cutting operation is being extended at the expense of crushing, and it is now not uncommon to come across junior surgeons,

V.—Cases operated on by Lieut.-Col. H. C. Buckley, I.M.S., Civil Surgeon of Saharanpur, during a period of 3 years.

	Cases.	Deaths.
Litholapaxy	195	7
Suprapubic lithotomy	18	3

VI.—Furnished by Lieut.-Col. B. E. M. Newland, I.M.S., from the records of the Civil Hospital, Moradabad, for 1924, 1925 and 1926.

	Cases.	Deaths.
Litholapaxy	200	1
Suprapubic lithotomy	9	4

VII.—Furnished by Lieut.-Col. C. H. Reinhold, I.M.S., from the records of the Civil Hospital, Meerut, for 1924, 1925 and 1926.

	Cases.	Deaths.
Litholapaxy	129	2
Suprapubic lithotomy	8	3
Lateral lithotomy	13	2

VIII.—Furnished by Major M. L. Puri, I.M.S., from the records of the Civil Hospital, Multan, for 1924, 1925 and 1926.

	Cases.	Deaths.
Litholapaxy	262	7
Lithotomy (variety not specified)	24	3

IX.—Furnished by Rai Bahadur Dr. Mathradass, Assistant Surgeon, from the records of the Civil Hospital, Moga, for 1924, 1925 and 1926.

	Cases.	Deaths.
Litholapaxy	113	5
Suprapubic lithotomy	18	5
Lateral lithotomy	11	..

Taking these series as typical of the more active stone hospitals, it will be seen that the feeling generally here is strongly in favour of litholapaxy, as contrasted with the cutting operations, and the opinion thus demonstrated is reinforced by some correspondence which appeared in the *British Medical Journal* in 1925, consequent on the article above alluded to. This correspondence also furnished some striking evidence of the decline of the operation of litholapaxy in some of the large English hospitals, especially during the war period. On the other hand, in spite of this admitted decline, no one came forward to rebut the contention put forward in my paper, that litholapaxy should ordinarily be considered the operation of election. Surely there is something abnormal in the present position outside India with regard to this question. Here, it is clear enough. The references I have recently made to representative surgeons have produced an overwhelming mass of evidence in favour of the crushing operation, which it is agreed should be carried out wherever reasonably possible. To subject a child with a small stone to

surgeons that litholapaxy in proper hands has great advantages over any of the cutting operations in all but a small percentage of complicated cases, and it would be a *very great pity if the contrary view were to be generally accepted* and taught in the British schools particularly in the case of men who are destined to practise in the east

I append a list of cases treated in four representative hospitals of the Bombay Presidency, which were collected for an article in the *British Medical Journal* in 1925 together with 5 lists recently obtained from other sources Many more extensive series have appeared previously from time to time, but they seem to have passed too readily into oblivion

I —Cases operated on by Lieut Col R W Anthony, F P C S E, I M S, during three years and three months in 1920—1923 at the Civil Hospital at Hyderabad, Sind

	Cases	Deaths
Litholapaxy (including 30 perineal litholapaxies)	1 253	7*
Suprapubic lithotomy	11	3

* Three others discharged otherwise —probably died

This is the most noted centre for vesical calculus in India, and has dealt with an average of 461 cases a year during the last ten years

II —Cases operated on by Lieut Col T S Novis F R C S, I M S, at the Jamsetjee Jeejeebhoy Hospital Bombay, from June 14th, 1920 to December 31st, 1923

	Cases	Deaths
Litholapaxy	114	1
Suprapubic lithotomy	17	5
Perineal lithotomy	2	0

Note —Of the deaths from suprapubic lithotomy two were complicated with prostatectomy and two developed pneumonia

This is the chief hospital in Bombay and associated with the Grant Medical College

III —Cases operated on by Lieut Col A J Vernon Betts, M B, I M S, at the Civil Hospital, Nasik, from November 1st, 1922 to October 31st, 1923

	Cases	Deaths
Litholapaxy	58	.
Perineal lithotomy	3	1
Suprapubic lithotomy	5	

IV —Cases operated on by Lieut Col A Hooton, I M S, at the Agency Hospital, Rajkot, from December 5th, 1920 to March 23rd, 1923

	Cases	Deaths
Litholapaxy	91	2
Perineal litholapaxy	5	
Suprapubic lithotomy	15	
Perineal lithotomy	1	1

3. The main contra-indications to litholapaxy may be stated as follows:—(*a*) An unduly small urethra, or large or very hard stone. It is in these cases that perineal litholapaxy is so useful. (*b*) Tumours of the bladder, or excessively enlarged prostate. (*c*) Sacculation of the bladder, or encysted calculi. (*d*) Stone associated with abscess at the neck of the bladder.

4. The best alternative to litholapaxy is usually suprapubic lithotomy, but I suggest that perineal lithotomy, contrary to the dictum of some authorities, who lay down that it is entirely obsolete, still has its uses. It is, I think, the operation of election in cases of stone encysted in the prostate or at the neck of the bladder whether associated with abscess or not, and might be useful for vesical calculus co-existing with serious stricture of the urethra and dilatation of the urethra behind the stricture. I have also employed it with advantage in cases of moderate sized stones with severe cystitis when drainage seemed advisable.

Acknowledgments.

In addition to the surgeons quoted above I have to thank Col. R. F. Baird, I.M.S., and Lieut.-Col. T. Hunter, I.M.S., for much valuable information.

References.

Hooton, A. (1925) .. .. The Decline of Litholapaxy, *Brit. Med. Jour.*, April 11th.
Southam, F. A. (1925) .. .. *Brit. Med. Jour.*, April 1st.
Jolly, J. Swift (1925) .. .. *Brit. Med. Jour.*, May 9th.
Andrews, J. Alban (1925) .. .. *Brit. Med. Jour.*, May 9th.
Coleman, R. R. (1925) .. .. *Brit. Med. Jour.*, May 16th.
Keith, Forbes (1892) .. .. *Lancet*, June 4th.
Baker, R. (1896).. .. .. *Lancet*, October 10th.
Henderson, W. H. (1900) .. .. *Ind. Med. Gaz.*, August.
Stevenson and Evans (1909) .. Proceedings of the Bombay Medical Congress.

DISCUSSION.

Lieut.-Col. W. L. Harnett, I.M.S. (Bengal): In Bengal and Assam there was a growing tendency to remove stones by suprapubic cystotomy instead of by litholapaxy. He did not agree with General Hooton's contention that there had been any changes in teaching in England, as the latest textbooks on surgery all gave sound advice on the subject and litholapaxy was extensively performed in all the hospitals in England to which stone cases came in numbers. He thought this tendency amongst surgeons in Bengal might be explained by certain special circumstances: (1) The lack of the necessary practice, stone cases were not really so common in Bengal and Assam as in some other parts of India and only surgeons in charge of fairly large hospitals could obtain that manipulative skill which was necessary for success. (2) The high cost of the necessary instruments. Shortage of money was chronic with all local fund hospitals and the provision of a set of lithotrites and evacuators was only possible in head-quarters hospitals. (3) The physical development of the population was such that the genital organs were of small size in a large proportion of the patients, necessitating

a serious cutting operation, when a cure can be effected by means of a lithotrite, with little more disturbance than the passing of a catheter would cause, is, I consider, quite unjustifiable and if the surgeon to whom the case originally comes is not prepared to crush, he should pass it on to some one who is

A few words may perhaps be added with regard to the operation of perineal litholapaxy the special Indian development of which is commonly known as Keith's operation This procedure seems to be almost confined to Hyderabad Sind, and those operators who have come under the influence of surgeons of the Hyderabad Civil Hospital. The original operation of perineal litholapaxy, which went by the name of Dolbeau, the French surgeon consisted in making a large perineal incision, similar to that employed in median cystotomy, and utilizing very large and powerful instruments to effect a rough breaking up of stones of excessive size the fragments of which were extracted by means of lithotomy forceps Keith's operation is a very different procedure The patient being in the lithotomy position a very small incision or rather stab is made upon a median grooved staff from an inch to an inch and a half in front of the anus according to age A director is inserted into this incision which is then dilated (using the director as a guide) to a convenient size by Hegar's dilators and the operation is completed through this opening in the same way as an ordinary litholapaxy by means of ordinary cannulæ and lithotrites The operation is useful in some cases of large or particularly hard stones or when the urethra is unusually narrow or presents some obstruction such as a stricture The wound is so small that it usually heals in a few days and indeed in a large proportion of cases only a few drops of urine pass by it The patient is usually discharged after 2 to 5 days The advantage of Keith's operation is that it enables one to extend almost all the benefits of litholapaxy to a certain proportion of cases (especially in children) which would otherwise have to be submitted to one or other of the regular cutting operations

Conclusions

The conclusions I would submit then are as follows —

1 Litholapaxy is still in the present state of our knowledge the operation of election for all cases of stone in the bladder in which no definite contra indications exist It presents the advantages over cutting operations that there is no wound, and no dressings or special nursing are required Convalescence is much shortened, and in skilled hands the mortality is less than that of the cutting operation There is moreover, no evidence that recurrence is unduly frequent after litholapaxy In this connection it has to be remembered that recurrence is not unknown after cutting operations

2 The acquisition of dexterity in litholapaxy as in many other surgical procedures requires practice but that is no reason for abandoning the operation Experience in Indian hospitals shows that any operator of average ability can easily acquire the necessary manipulative skill It is however an advantage to have the advice and assistance of a skilled operator to begin with

success and little mortality. The operation is done in 5 to 7 minutes; and during the past 7 years I have been in charge of the institution, I do not think there have been more than 1 or 2 deaths from the operation, and that too in badly complicated cases.

Litholapaxy is, no doubt, the operation of choice in places where vesical calculus is very common, and one can easily gain the necessary experience, but in areas where it is rare, I am of opinion that suprapubic lithotomy is a much safer procedure. Again, in the large majority of cases that one sees in Mysore State, the stones are very hard and large, one weighed as much as 9 ozs.; and chronic cystitis is a very common complication. For such cases, suprapubic lithotomy is more suitable than litholapaxy.

Dr. S. B. Surti (Hyderabad, Deccan State, B. India): I agree with Dr. Subba Rao in a good many points as I find that in district hospitals where enough material is not supplied and in the absence of a cystoscope one does not know what one is doing. Moreover, out in the taluk dispensaries which are placed in the hands of inexperienced sub-assistant surgeons and where there is, still more, lack of proper appliances, I do not think it would be advisable to encourage lithotrity operations, as one or two fatal cases would prevent more cases from coming for treatment, whereas the suprapubic operation can easily be performed by even an inexperienced medical officer without the chance of high mortality.

Capt. K. S. Nigam, I.M.S. (United Provinces): Litholapaxy is the operation of election. Not much technical practice is required to master it. Suprapubic lithotomy is also indicated in complicated cases.

Lieut.-Col. Sir F. P. Connor, I.M.S. (Bengal): General Hooton's paper is very acceptable because there is an undoubted tendency to teach that suprapubic lithotomy is the operation of election for bladder stone. This is only due to the fact that in some countries surgeons have little opportunity to practise the operation of litholapaxy. It is very much the same as in the operation for cataract by the intracapsular method. This will never be popular in any country where cataract is not very common, because it is too difficult an operation to learn without much practice. Where litholapaxy is controlled by cystoscopic examination, it becomes one of the best operations of surgery. Cases may even be discharged from hospital on the same day and, as General Hooton has remarked, the Indian ryot is a keen observer in such matters and the fact that he and his neighbours will come into hospital in great numbers for the operation, alone proves that the after-results are good.

The operation should not be performed in small dispensaries or hospitals, but only where the surgeon is in a position to be familiar with the best surgical methods.

Rai Bahadur Dr. Surju Prasad (Indore State, B. India): The treatment of vesical calculus by means of litholapaxy is a settled operation now and requires no comment. About the year 1880, Sir Henry Thompson invented the lithotrite and used to crush stones leaving the debris to pass with the urine. The patient was anæsthetized on several occasions for the crushing of the stone until all the debris had been removed (Lithotrity by several sittings). Dr. Bigalow of America invented the evacuating catheter and bags and began to crush the stone and remove it completely at the same time (Litholapaxy). This operation was practised by many American and

the use of instruments of smaller size which prolonged the operation (4) The great frequency of early strictures not yet small enough to narrow the stream of urine but detected at once by the urethroscope and sufficient to render instrumentation very difficult (5) The high proportion of cases with severe septic changes in the bladder and often in the kidneys also, although a mild degree of sepsis was not a contra indication of litholapaxy, extreme caution was necessary in severe cases The speaker made it a rule to carry out a kidney efficiency test in all septic cases and to perform the suprapubic operation in all cases in which the results of the tests were not satisfactory (6) The prevalent idea that the recurrence rate was very high after litholapaxy owing to fragments being left behind The remedy was to perform cystoscopy at the conclusion of the operation and it was surprising in what a number of cases quite large fragments were thus discovered The cystoscopic lithotrite though difficult to use was of value for such cases

Major K K Chatterji (Bengal) I agree with Major General Hooton in what he says about litholapaxy being the best operation for vesical calculi I, however suggest that the bladder should be properly inspected by an irrigating cystoscope, which, for apparent reasons is better than an ordinary cystoscope—the inspection being made while irrigation is being done so that the view is not obscured by the fluid being discoloured by blood

I have had the misfortune of having to remove a large number of vesical calculi by suprapubic lithotomy The patients preferred this method having had recurrences after litholapaxy These cases of recurrences were not in patients from Bengal but from Northern India where the surgeons are quite expert in litholapaxy I think these recurrences are explained by the fact that very likely cystoscopic examinations were not made I have seen Mr C Ryall using his cystoscopic lithotrite with great facility but I have found that some difficulty is experienced due to the view being obscured by the discoloration of the fluid in the bladder by blood, stone dust, etc

Rai Bahadur Dr Upendra Nath Ray Chowdhury (Bengal) Being a student of Sir Havelock Charles, I am a strong advocate of litholapaxy for stone in the bladder and I thoroughly agree with the observations of General Hooton in his valuable paper With a little skill, litholapaxy can be safely adopted as the method of choice The operation does not render the patient confined to bed for as much time as the suprapubic cutting operation which sometimes leads to a fistula which takes a couple of months to heal When I undertook the operation of litholapaxy, I did not know as much as I do now and I operated on septic bladders but with very few complications and certainly with no mortality I have operated on children of 7 years and on old men of 55 without much trouble Regarding perineal litholapaxy, I must say the operation has deservedly been abandoned I have had strictures following lateral lithotomy Litholapaxy in my opinion is the operation of choice

Dr S Subba Rao (Mysore State, B India) As the Director General stated in his Presidential Address this morning it is not wise to make general statements about India, based on one's local experience in a small province or district In Mysore State vesical calculus is not very common, about 15 cases being operated upon every year in the Victoria Hospital, Bangalore, where about 1,500 major operations are performed annually Suprapubic lithotomy is invariably performed on all cases with great

of reasonably well-equipped hospitals, not dispensaries. It must, of course, be admitted that litholapaxy should not be attempted without proper equipment and the equipment is very expensive. As regards the current teaching I regret that the most recent textbooks were not available for reference when I wrote my paper, and I dare say the practice of special genito-urinary hospitals in England, such as St. Peter's, London, might support the views expressed in my paper. But I have good reason to believe that both the practice and teaching of general surgeons in some of the large British general hospitals is not, from my standpoint, nearly so satisfactory.

Indian surgeons, but Sir Henry Thompson did not like that the credit should go outside his country and subsequently suprapubic lithotomy was advocated and certain rules were framed regarding the operation The subject was fully discussed at one of the sittings of the British Medical Association about the year 1882 1883 Resolutions were passed that statistics should be prepared which would decide the question of the future treatment of stone in the bladder Litholapaxy was at this stage limited to adult males only and was not practised in children under twelve years of age It was at the Indore Hospital that the crushing of stone was started in children of tender age by means of a locally made No 5 lithotrite Indian surgeons have proved long ago that litholapaxy in all sorts of patients is the operation of choice in the great majority of cases With very rare exceptions I always deal with stone in the bladder by litholapaxy and the result is in almost all cases simply marvellous The patients as a rule are discharged in 3 or 4 days without undergoing any cutting operations

To perform litholapaxy it is necessary to have a complete set of lithotrites and evacuating catheters say 6 of each beginning from No 1 upwards alternatively and 2 evacuating bags These costly instruments cannot be provided for all dispensaries but it is justifiable that every district hospital should have them Deep anaesthesia is necessary in stone operations Therefore spinal anaesthesia is not used a good chloroformist will be required to help the surgeon To a novice the operation is not easy and I know a case where a doctor of 15 years service tried to crush stone without making any impression on it in about 3 hours Stone is a rare disease in Europe and in some parts of India Those who get their training at medical schools at such places are not sufficiently fitted as a rule to practise litholapaxy and I suggest that post graduate classes should be started for imparting practical training on treatment of stone in such places where it is very common

Dr R N Coorlawalla (Hyderabad State, Deccan B India) The experience of a quarter of a century in the Deccan, where the districts of Raichur and Mahboob nagar supply us with cases of vesical calculi has demonstrated the superiority of the operation of crushing calculi over those of cutting operations Up to the year 1900, lateral perineal lithotomy was the recognized operation for the young or old From 1901, up to date, litholapaxy was the operation of choice Suprapubic lithotomy is performed when litholapaxy is contra indicated on account of (*a*) large size of the stone, (*b*) impacted or sacculated stone, (*c*) narrowness or stricture of the urethra in relation to the size of the instrument required to be passed into the bladder, (*d*) stone impacted at the neck of the bladder The advantages of litholapaxy are (1) Rapid recovery and easy discharge from hospital (2) Escaping a cutting operation and consequent inconvenience of having a wound (suprapubic or perineal) that requires to be dressed frequently and which takes anything from 10 days to 3 or 4 weeks to heal Recurrences after litholapaxy are not frequent Litholapaxy requires manual dexterity, care and patience The maxim to be adhered to is, that the water washed out in the evacuator should not be stained red with blood This is possible by following the usual rules of litholapaxy with care and patience

Major General J Hooton, I M S (British India) replied With regard to some of Col Harnett's remarks I have a few observations to make I should like to explain that in recommending the crushing operation in nearly all cases, I was thinking

the digital fossa may become completely obliterated by adhesion of the body epididymis to the body of the testis.

Sufficient has been said to make it quite plain that there is a great deal that remains to be discovered as regards the life-history of *F. bancrofti* and the pathology of human filariasis. It is not necessary to labour this point any further, except to repeat that it is of the utmost importance to the progress of tropical medicine and the well-being of millions of residents in the tropics that these blanks in our knowledge should be filled up.

The *surgery of filariasis* adds greatly to the bulk of work which falls to the lot of the surgeon practising in the tropics in endemic areas. Some of this is due to direct complications of the disease, as far as we can tell, and some to secondary septic complications. These may be roughly classified as follows :—

(*i*) Filarial fever, which may occur without other obvious complications, or in connection with definite inflammatory conditions.
(*ii*) Lymphangitis, cellulitis, abscess, gangrene.
(*iii*) Orchitis, funiculitis, hydrocele, synovitis, arthritis.
(*iv*) Lymphatic-varices, gland-varices, lymph-scrotum.
(*v*) Chyluria and chylous effusions into the tunica vaginalis, peritoneum pleura, etc.
(*vi*) Elephantiasis of the legs, scrotum, arms, mammæ, vulva or skin.

The problem of treatment has next to be considered. It has already been stated that our present state of knowledge is, in this respect, most disappointing. As in all other parasitic diseases, early treatment is much more effective. This especially applies to filariasis, where the established disease means organic lesions, the outcome of years of pathological changes in the tissues. Our first efforts are needed to effect an early diagnosis, but this is often not possible. In localities where filarial infection is almost universal, it would be justifiable to employ specific drugs on a large scale if a good anthelmintic was available. The results of a small series of early cases treated by the injection of 'soamin' are encouraging. Intravenous injections are employed bi-weekly, two of one grain each and two of two grains and three grains each ; after an interval of one week a second and a third course may be given. If it can be proved that preparations of arsenic or antimony are of value for the treatment of *early* cases of filariasis, a definite campaign would be possible. So far it is always the old cases of established disease which are attacked by various anthelmintics.

Prophylaxis is of course the first consideration, but the extermination of the many species of mosquitoes which are known carriers is beyond the present scope of practical medical politics in rural areas. Prophylactic use of drugs might be of value, as in the case of malaria.

Surgical treatment is necessary for a comparatively late phase of filarial infection and is, as already mentioned, a confession of failure to prevent the disease in its earlier stages. Nevertheless, surgery is both necessary and valuable. Every

THE SURGICAL ASPECTS OF FILARIASIS

BY

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THE object of this paper is to draw attention to the enormous incidence of filarial disease as gauged by its surgical manifestations alone, and to our ignorance of much of its pathology and of effective methods of treatment

Parts of south Europe are known to be infected, and Africa India China the Pacific Islands, Australia and the West Indies are well known endemic areas This means that there are millions of infected individuals many of whom have their lives made a misery by repeated attacks of fever or inflammation, by swellings and deformities, or by more serious lesions involving the internal organs

It is probable that in most cases ten or fifteen years of infection and re infection are necessary to produce the clinical types of filariasis ordinarily met with Great numbers of adult filariæ are involved in the pathological processes It is, therefore, more than probable that any effective remedy would confer a great benefit on mankind *by destroying the offending parasites long before any permanent damage* had been done to the host

The surgery of filarial affections is at best a confession of previous failure The damage has already been done and plastic procedures are all that are left to us As in the case of bilharziasis early treatment is demanded before the pathological processes have permanently injured the tissues

Manson discovered the mosquito cycle in the development of *Filaria bancrofti* in 1878, and in 1880 he described the peculiar habit called 'filarial periodicity' At a post mortem examination performed by him more than thirty five years ago he demonstrated the resting places of the microfilariæ during their diurnal period of inactivity With this lead, it would seem almost incredible that our knowledge of the pathology and treatment of filariasis has advanced hardly at all in the fifty years which have elapsed since those epoch making discoveries The success already achieved by the 'Kala azar Commission,' proving as it does the value of concerted work in the field and in the laboratory, points the way to what is needed for the thorough elucidation of the filariasis problem It is a reproach to tropical medicine that this work has not already been carried out It would be very fitting *if funds could be made available for this research to be carried out in India*, where

of the empty tunica towards the operator. The almost avascular gubernaculum testis is sufficiently divided by a few snips with a pair of scissors, to facilitate the subsequent replacement of the testis in its new bed. The cut edges of the tunica are sutured together by interrupted catgut stitches to maintain the everted position of the serous coat behind the epididymis.

The testis is gently replaced within the scrotum after the operator has again satisfied himself that all hæmorrhage has been arrested. Silkworm gut sutures are used to bring together the cut skin and dartos edges, the sutures being inserted deeply to prevent hæmorrhage from these tissues—a not uncommon complication. A drainage tube is seldom necessary.

Tincture of iodine is applied freely over the wound, followed by tinct. benzoini co., and after adding sufficient gauze and cotton-wool a bandage is adjusted as over an amputation stump, connected with a waistband so as to sling up the scrotum as far as possible.

As in all scrotal operations, the most important post-operative precaution is to avoid the slightest soiling of the wound by urine. A covering of oiled-silk is useful, but still more essential is proper supervision during the act of passing water. The urine is much more safely voided into an open kidney-bowl than into an urinal, the patient lying on his side. It is seldom necessary to remove the dressings before the eighth day, but if the patient is uncomfortable, the dressings may be changed on the fourth day.

Filarial synovitis, arthritis and abscess of joints are treated on ordinary surgical lines, in the absence of any very satisfactory specific treatment for filariasis.

Filarial lymphangiectases are best left alone, or treated by pressure bandages. Operative treatment is not very satisfactory except in localized distensions, or in pendulous parts as in lymph-scrotum. Gland-varices are similarly not very amenable to operation, as re-accumulation of fluid may occur at or near the same site.

Lymph-scrotum is often treated by suspension, mildly astringent lotions and powders, and as much rest as the patient can afford. But recurring attacks of local inflammation, accompanied by profuse extravasation of lymph, are very troublesome and a gradual increase in the size of the swelling is likely to occur. Total excision of the scrotum, as for ordinary cases of elephantiasis, may afford great relief. The testes are accomodated in pouches fashioned beneath the skin and superficial fascia of the contiguous adductor surfaces of the thighs. An increase may occur in the size of lymphangiectases already present, but this is a lesser evil.

Chylous extravasations in the tropics are usually the result of over-distention and leakage of some part of the thoracic duct system, or back-pressure causing the giving way of connected lymphatic tracts. In this way, chylous effusions occur into the peritoneum or pleura, into the tunica vaginalis, into the urinary tract, etc.

Treatment is very unsatisfactory. Rest in bed with elevation of the pelvis gives relief. Light diet with very little fat is given and careful nursing is provided.

surgeon who sets out to practise in the tropics must learn the recognized procedures which have been evolved for this purpose

Filarial fever when associated with other surgical complications is treated like other inflammatory fevers When no evidence is forthcoming as to its essential cause it is advisable to try injections of soamin and mixed streptococcal vaccines if possible autogenous in addition to rest in bed and symptomatic treatment

Filarial lymphangitis cellulitis abscess and gangrene are treated by the usual surgical procedures But in the case of filarial erysipelatoid inflammations it is well to bear in mind that surgical interference is not often necessary resolution taking place in most cases under appropriate treatment as in ordinary erysipelas

Funiculitis is a very serious condition which is now generally agreed to be filarial in origin It requires energetic treatment as soon as the diagnosis is made In advanced cases the surgeon must not hesitate to excise the testis and cord When seen in an earlier stage the inflamed cord is to be freely exposed and its component parts isolated by blunt dissection followed by free drainage It is important not to mistake ordinary attacks of acute epididymitis or inflammation of the cord for the fulminating condition known as funiculitis

Orchitis and epididymitis usually respond to symptomatic treatment—rest in bed elevation of the part hot compresses More rarely an abscess may form, or protracted inflammation may demand more active surgical treatment

Filarial hydrocele may be acute or chronic Acute cases are best treated by rest and other palliative treatment unless there is evidence of suppuration When a hydrocele whether filarial or otherwise has become stationary or progressive it is best treated by open operation The injection of irritants such as iodine or carbolic acid is often painful and never a certain method of cure No method of treatment by electrical methods has yet been found to be wholly satisfactory

In the case of very large hydroceles it is advisable to keep the patient in bed for a few days with the thighs bandaged together so as to elevate the scrotum This will slightly reduce the size of the hydrocele and considerably reduce the vascularity of the part The skin of the scrotum must be very carefully scrutinized and any patches of eczema excoriations ringworm or boils completely cured before undertaking the operation

Most patients prefer a general anaesthetic but the operation can be performed quite satisfactorily under spinal or local analgesia The incision is made over the prominence of the swelling or in the case of double hydroceles a single incision alongside the median raphe will suffice

The sac is opened and the fluid allowed to escape The simplest procedure known as Pratt s operation is to press out the testis through a small opening in the tunica and to leave it everted in this way But care must be taken if this is done not to allow any part of the sac to remain inverted as a recurrence may follow

A more thorough operation particularly if the hydrocele is large or of moderate size is recommended The sac is completely opened and the cut edges grasped at the lower end of the incision The testicle is thus held up with the raw edges

filarial disease and of the absence of any really reliable method of cure. Considering our advances in many other directions, it seems very curious that a problem of the magnitude and economic importance of filariasis should be thus neglected. It is not too much to hope that the present session of the 'Far Eastern Association of Tropical Medicine' will give an impetus to this plea sufficient to bring into existence some properly organized commission of filarial research.

No drug which acts in a definitely specific manner is known, though many have been tried. Intravenous injections of soamin, continued for some time, appear to have a beneficial effect.

The intimate pathology of chyluria and some other chylous effusions has been worked out in individual cases. It is not necessary to go into this in detail here.

Elephantiasis of localized areas of skin and subcutaneous tissues, but more often of pendulous parts of the body such as the legs, scrotum, arms, mammæ, vulva, etc., are perhaps the best known manifestation of filarial disease. It is in connection with these swellings and deformities that a considerable amount of surgical ingenuity has been expended. For the most part, these operations go no further than the removal of the sodden tissues which, owing to their position or cellular structure, *offer a site of least resistance for the collection of lymph unable to* circulate freely along the normal channels. More ambitious operations have been attempted, such as the anastomosis of large obstructed lymph vessels with neighbouring veins, but without much benefit. It is quite possible that more extensive lymphatic surgery will be practised to repair damage already done, when an efficient anthelmintic is discovered to deal with the adult filariæ living in the body. It would then be worth while to attempt plastic operations to deal with defects in the thoracic and other large lymph ducts.

The surgery of filariasis is, however, by no means disappointing. The removal *of large masses of solid œdema not only gives a new lease of active life to a patient* who in some cases has been confined to his bed for years, but it has the further advantage in most cases of arresting the local recurrent attacks of erysipelatoid inflammation. These are a constant source of danger and anxiety to the patient.

The surgical methods employed by most operators who have had experience of tropical surgery are well known and need not be described in detail here. But, as in other branches of surgery, there is a great deal to be learnt with regard to the proper technique of these operations and there are undoubtedly possibilities for further developments, particularly when the pathology of the disease is better understood.

Among the surgical procedures for the removal of filarial enlargements, none have perhaps attracted more attention than the operation for elephantiasis of the scrotum. This is natural, as an enormous bulk of tissue has often to be removed, perhaps larger than by any other operation in surgery. The patient is also restored by its successful performance to his ordinary active life and to his full sexual functions in a most dramatic way. The technique of this operation has been worked out in great detail in India and a description will be found of the method advocated by the present writer in the *British Journal of Surgery*, Vol. X, No. 38, 1922.

Much that has been discussed in this paper and more will be found in any text-book of tropical medicine. It has not been the purpose of the writer to burden the reader with a detailed account of the pathology and surgery of filariasis. The sole object has been to emphasize the extraordinarily backward state of our knowledge of some aspects of the life-history of the filarial worm, of the pathology of

He was admitted with symptoms of severe toxæmia such as pyrexia, stupor and delirium. Repeated cultural tests of the blood, the lymphocele fluid and the fluid from the iliac cyst as well as smears from these were negative. The fluid drawn from the cyst was clear with a few flakes of lymph floating in it. Injections of polyvalent anti-streptococcic serum had no definite or lasting effect. After emptying the cyst and introducing my finger into it, I felt a small rounded body,—a cyst, lying loose in the cavity (Plate XXI, fig. 1). This was made over to Dr. G. Panja for Colonel Acton of the pathological department of the School of Tropical Medicine ; there were numerous microfilaria in this little cyst (Plate XXII, fig. 2). Serial sections of the cyst were made and Dr. Maplestone's report is as follows :—

'Fibrous tissue formation, the outer layers of the cyst wall being dense and hyaline in character with few cells present and showing early deposit of calcium. The inner layers are more loosely laid down with numerous fibroblastic cells, and are of more recent formation than the outer layers. The two layers grade into each other imperceptibly' (Plate XXII, fig. 3).

The toxic symptoms abated and eventually disappeared, the temperature coming down to normal after the drainage of the fluid and continuous irrigation. In this case investigations were made in order to associate the patient's condition with streptococcal toxæmia, but the weight of evidence seemed to be in favour of toxæmia due to filarial infection.

In filarial lymphangitis, streptococci have been considered the causal agent, though, as I have already stated, filarial irritation as a primary or accessory factor cannot be ignored.

I may incidentally refer to the toxic properties of parasitic fluids such as hydatid fluids, the fluids secreted by the guinea-worm and the toxic symptoms observed in round-worm infections.

I shall now consider filariasis from a different aspect. It is in reference to the changes that are produced in tissues in the later stages of the disease. There is obstruction in the lymph route, lymphangiectasis and lymph stasis, lymphangitis and perilymphangitis, cellular exudation, proliferation and hyperplasia resulting in elephantiasis. We have to admit that stagnated lymph can not in all aspects be identical with physiological lymph ; besides the physical, chemical and cellular changes in this lymph, it would contain some toxin-like substances. It would be difficult to explain the elephantiasic changes in the tissues by the mechanical obstruction to the lymph-flow alone if we did not take into account the effect of the toxin-like substances that would be present in the lymph.

The rôle played by parasites in the induction of cell-proliferation, hyperplasia or hyperblastosis and even in the genesis of neoplasms, non-malignant or malignant, is a subject which is being closely studied. Recent researches seem to indicate that the presence of parasites or their disintegration products stimulate simple and even regressive proliferation of cells. As a matter of fact, a close sequence of these processes has been established, neoplasms having been produced

FACTS BEARING ON THE SURGICAL PATHOLOGY OF FILARIASIS

BY

Lieut Col K K CHATTERJI, M C, F R C S, I M S,
Surgeon, Medical College Hospital, Calcutta

In surgical practice in India and in the tropics we come across conditions *which can be directly or indirectly attributed to the action of a toxin like substance* produced by *Filaria bancrofti* The object of my paper is to make an attempt at establishing a correlation between this helminthic infection, the pathological conditions produced, and the clinical and operative findings Much has been said about the morphology, life history and pathogenesis of the parasite, the co existence of secondary streptococcal and other infections and their bearing on the clinical syndrome has drawn considerable attention, but a study in a newer light of the sequence of events that follow after the human host has been *parasitized* and the end results as evidenced by the pathological conditions *produced* may be interesting

The toxin like substances may be derived from the *living worms themselves or their disintegration products or from secondary infecting organisms* In some conditions, the clinical manifestations have a remarkable resemblance to those produced by streptococcal infection, though there may be a streptococcal element it cannot be denied that the septicæmic condition is modified or augmented by the presence of toxin like substances produced by the primary filarial infection in other cases, however, the helminthic *toxæmia* [illegible] to be the predominating if not the only feature I have been persuaded to [illegible] the latter view [illegible] ome of my cases the blood picture and cultural [illegible] of the blood [illegible] finds are in favour of more or less unmixed filarial [illegible] In my previous publications I have made references to cases [illegible] the toxic properties [illegible] in filarial cysts have been strongly suggested [illegible] cyst which was drained by an [illegible] to prevent the fluids from contaminating the [illegible] followed though, according to [illegible] draining these cysts, we now [illegible] means of a small tube [illegible] early elephantiasis of the [illegible] giectasis of the [illegible]

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PLATE XXI

A



B.



C.

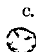


Fig 1.—Loose cystic body in the cavity (A) The entire cystic body part of the membranous wall of which has been dissected off from the upper part (B) The cyst wall opened (C) One of the many smaller cysts found inside A, *those cysts contained micro-filariæ bancrofti.*

Plate XXI

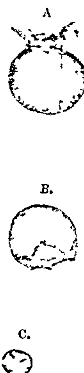


Fig. 1.—Loose cystic body in the cavity. (A) The entire cystic body part of the membranous wall of which has been dissected off from the upper part. (B) The cyst wall opened. (C) One of the many smaller cysts found inside A; those cysts contained *micro-filariæ bancrofti*.

Explanation of Plate XXII.

Fig. 2. *Microfilaria bancrofti* found in the smaller cysts (*see* Plate XXI, fig. 1 C.)

„ 3. Microsection of the cyst.

„ 4. Epithelioma engrafted on preputial elephantiasis; there was a certain amount of hyperkeratosis.

„ 5. Microsection of an elephantiasic scrotum taken from its upper part ('neck' of the tumour). Marked dilatation and thickening of lymph vessels, marked increase of fibrous connective tissue (fibroblasts), not marked hyperplasia.



Fig. 2



Fig 3.

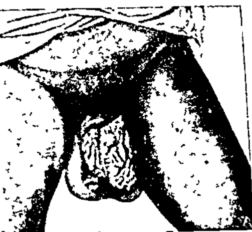


Fig 4.



Fig. 5.

I have seen some cases of multiple hard tumours distributed over the body associated with elephantiasis of the scrotum, a condition comparable to fibromatosis (Plate XXIII, fig. 9). I have already referred to the changes produced in the epithelial and subepithelial layers; papillomatosis is seen and in many cases marked hyperkeratosis which, as we all know, is a precursor of papilloma and cancer. As a matter of fact, in one case which I have already reported, the pathological diagnosis of one of the growths was epidermoid carcinoma. These are my reasons for considering elephantiasis a condition very closely resembling hyperblastoma or blastomatosis.

These are some of the intricate problems of filariasis and I invite a study of the subject in the lines of my findings, namely, in the earlier stages of the disease whether toxic and other conditions are due to filarial toxins, streptococcal toxins or both, the one modifying or augmenting the other. In the later stages of the disease, after elephantiasis has established itself, the nature of the tissue changes, viz., proliferation, hyperplasia, metaplasia, etc., leading to the elephantiasic condition which has a close resemblance to blastomatosis. The relation of this condition to neoplasms is comparable to mammary adenomatosis, adenoma and adenocarcinoma. A further study and elaboration of these ideas will, I hope, help the surgical and operative treatment of filariasis.

DISCUSSION.

Dr. R. H. H. Goheen (Bombay): In connection with Sir Frank Connor's paper I would ask whether elephantiasis is necessarily always of filarial origin. In a town in western India, Vengurla, in 20 years of residence only one case of elephantiasis has been seen among the local residents. That patient, a young man, has never been away from the town. He has had periodic fevers suggestive of filariasis, but careful and repeated examinations of the blood have all failed to show microfilariæ.

In certain parts of America, as I found in visiting Charleston, S. Carolina, some years ago, the incidence of filariasis is high but elephantiasis is unknown.

Dr. S. Sundar Rao (Bengal): Col. Acton and myself working on the pathology of filarial diseases, at the Tropical School here, have found that the adult worm lives chiefly in the abdominal-retroperitoneal lymphatics and glands and brings about the following pathological changes:—Fibrosis of the main lymphatics, thickening of walls, papillomatous ingrowths, blockage of afferent lymphatics, back pressure in glands lower down, dilated lymph spaces in the hilum and lymph canals. In others, immature forms are caught up in the gland substance causing death of the worm and absorption, or, in some cases, forming abscesses in glands. The damage to the lymphatics described above going on for a long time, say 15 years, as cases of filarial diseases below the age of 15 are rare, forms a good nidus for strepto- and staphylococci. These are recovered on culture from cases of filarial diseases, viz., abscess, funiculitis and chyluria and produce the fever, abscess, etc. Further investigation of these cases of filarial disease show that a large percentage of them have a septic focus in the body chiefly along the alimentary canal, e.g., pyorrhœa, or foci in the tonsils or bowels, and we have been able to control

EXPLANATION OF PLATE XXIII

Fig 6 Microsection of the same tumour as in Plate XXII fig 5 taken from the lower thickened portion of the scrotum Dilatation and thickening of the lymphatics and hyperplasia of connective tissue

„ 7 A peculiar case of lymphangiectasis of the scrotum and thigh

„ 8 Microsection of a tissue from scrotal lymphangiectasis (*see* Plate XXIII fig 7) Great dilatation of lymph spaces About these and the blood vessels are collections of plasma and mononuclear cells and lymphocytes, the former (plasma cells) predominating Eosinophile cells are not predominating

„ 9 Elephantiasis of the male breast, with multiple elephantiasic growths on the body This patient's elephantiasic scrotum was excised previously (Taken from 'Tropical Surgery and Surgical Pathology,' 1927, by the writer p 103)

The other two speakers are in agreement with my views inasmuch as they say that they consider fluids of filarial origin toxic. One speaker cited a case of a retro-peritoneal cyst which proved virulently toxic, which confirms what I have stated. The other speaker referred to abdominal tumours and cysts containing filaria,—the fluid from these was apparently not tested for toxicity.

Lieut.-Col. Sir F. P. Connor, I.M.S. (Bengal) replied: It is disappointing that there has been no response to the questions raised by me as to the means for early diagnosis of filarial infections. It is probable that early treatment would be of far greater value than treatment undertaken after the disease is thoroughly established.

It is gratifying to see in the Scientific Exhibition a very fine example of original research done at the King Institute, Guindy; it shows various stages of the life-history of a filaria in a common lizard with *Culex fatigans* as the intermediate host. There are also charts and diagrams of filarial surveys and other examples of original work. Much more research is needed in these lines to increase our knowledge of this neglected subject.

Some of the speakers have dealt with the question of possible toxins and toxic effects, but we require more proof of these.

The question raised as to the existence of elephantiasis without filarial infection, as by repeated attacks of septic infection or during the spread of cancer, is well known. But I was very interested to know that in Charleston there is a large incidence of filaria infection, but no case of elephantiasis has occurred in the city. This is a curious anomaly.

I have not met with any of the large cysts of the abdominal cavity with grumous and possibly toxic contents; also of cysts containing microfilariæ of unusually large size, which might possibly cause obstruction to lymphatics.

The belief that 'tropical hydrocele' is not the same thing as filarial hydrocele is admitted by the speakers, but we have had no suggestions regarding its ætiology.

the recurring fever in some cases by eliminating these foci Col Harnett, I M S, and Major De, I M S have kindly supplied us with the material for our work

That the adult worm producing a toxin by its presence in the human system is known and is shown by the increase of eosinophiles but it is also true that the parasite by its mere presence does not cause any symptoms for quite a long time

Dr R N Coorlawalla (Hyderabad State, D India) One of the manifestations of filariasis, namely, large sized cyst formations in the abdomen is not so widely known as in the case of another parasitic disease viz hydatid cyst

I have come across four cases of large sized cyst formations in the abdomen due to the agency of the filaria one between the layers of the mesentery of the ileum and three arising from the under surface of the liver The microfilariæ were discovered in the gland evacuated from these cysts and later *microfilariæ were found in the peripheral* circulation of these patients and demonstrated again and again during the day in the first case and at night in the other three cases Notes on three of these above mentioned cases are printed in the *Deccan Medical Journal* 1927

The first case which came on the operation table as a case of acute intestinal obstruction was a well developed male adult of about 40 years of age A cyst occupying the whole of the upper and lower abdomen was found between the layers of the mesentery the intestine being acutely stretched across the upper and left side of the patient The fluid, evacuated from the cyst was thick grumous and brownish black somewhat like that from a multilocular ovarian cyst Millions of microfilariæ living and in a very active state were found in this fluid The microfilariæ were kept alive for 2 days in the incubator in the same fluid The microfilariæ from the cyst fluid were double and treble the thickness and length of those subsequently demonstrated from the peripheral circulation of the *same patient* *Marsupialization of the* cyst was performed and the patient made a good recovery Of the 3 other cases one was a male child about 10 years another a very old man The child was admitted for a smooth cystic enlargement of the right hypochondria and umbilical regions with a history of the right eyeball having suppurated a few months previously

In these four cases (1) The fluid evacuated was a characteristic dark brown or brownish black and thick (2) The interior of the cyst was stained with a similar dark brown or blackish pigment (3) Pain was present in the later stages of the enlargement, together with a history of the swelling growing very rapidly in the later stage, i e a few weeks before the patient sought relief in the hospital (4) There were no visible signs of lymphatic stagnation or œdema in other parts of the body (5) All these cases came from the environs of Hyderabad city In H E H the Nizam's Dominions there are large areas where filaria is endemic and where about 90 per cent of the population is visibly infected

Major K K Chatterji (Bengal) replied We confine elephantiasis to those in which filarial infection is present Filariæ are very often not present in the peripheral blood In these cases filaria have been found in sections of lymph glands and elephantiasic tissue Streptococcal infection may cause a condition similar to elephantiasis, but the two conditions have to be differentiated by microscopic sections etc Apparently similar pathological conditions are produced by different organisms

diagnosis. Tuberculosis is very common in southern India, and in all its stages may cause confusing abdominal symptoms. I have known a tuberculous abdomen or an amœbic hepatitis mistaken for a duodenal ulcer, because of typical hunger pain and a rigid right rectus muscle, while patients who have had an appendix removed for a supposed appendicular dyspepsia have at a later date required treatment for obvious tuberculous disease. In Madras, except in acute disease, it is our rule never to make a final diagnosis or recommend an abdominal operation until a full pathological report of the patient's fæces and urine has been recorded. The finding of ova or amœbæ in the stools, or bacilli in the urine will often decide the diagnosis in a difficult case. The question of treatment is largely an economic one. Simple medical remedies will, undoubtedly, cure an ulcer in its early stages, but when relapses have occurred, no Indian of the lower classes can afford the time, and few Indians in better circumstances appear to have the patience, to carry out the prolonged medical treatment which is necessary to produce complete cure. I think, too, that any surgeon who has studied a large number of duodenal ulcers in the operating theatre will agree that the scarring and stenosis of the common healed ulcer must cause continued symptoms and trouble.

The results of operation in my own patients are shown in Table II. The operation mortality of all the 1,396 gastric operations (1,353, gastro-jejunostomy, and 43, partial gastrectomy) performed at the Madras General Hospital between the years 1922 and 1927 is slightly higher, as would be expected when the records of thirteen surgeons are added together.

A death rate of 7·3 per cent for gastro-jejunostomy is high when compared with the statistics of European surgeons, but the material on which we work has a much lower resisting power, and we are constantly dealing with patients suffering from advanced stenosis, a condition associated everywhere with a higher mortality. The average weight of 300 of my patients was only 84 lbs. as compared with the average weight of a Madrassi, which is about 105 lbs. The lowest weight recorded has been 43 lbs. in a boy of 15 years, the youngest patient operated upon, while no less than 23 adult male patients weighed under 70 lbs. A systolic blood pressure of under 100 is very common and I do not often feel justified in performing a gastrectomy, an operation which few of our patients can stand. The cause of death has been, pneumonia, 11; shock, 3; hæmorrhage, 3; volvulus, 2; peritonitis, 3; heart-failure, 4 (in one a cholecystectomy was also performed and in 2, fatty degeneration of liver was noted at the post-mortem), ruptured liver abscess, 1; acute jejunal ulcer, 2; acute dilatation of stomach, 2; no cause (no post-mortem), 4. Careful attention to the teeth before operating has reduced our pneumonia incidence considerably, but it is always very difficult to persuade the Indian of its necessity. Too many of our patients are very poor risks and the mildest complication is apt to be disastrous. I have entirely given up the Fowler position after operation except for lung complications, and as a result our patients are happier, more comfortable and free from cardiac failure which was often a distressing complication in our earlier cases.

GASTRIC ULCERS IN SOUTHERN INDIA

BY

LIEUT COL E W C BRADFIELD M S F R C S I M S
Professor of Surgery Medical College Madras

MY object in writing this paper is to show that ulcers of the stomach and duodenum are very common in southern India and from a study of the large number of patients which have passed through our hands in Madras to suggest a cause for its prevalence This investigation began six years ago before which date only a comparatively few operations were performed for these diseases and many physicians held the opinion that true gastric and duodenal ulcer did not occur amongst Indians The sorting of a large number of out patients is always a difficult matter but when as is often the case in India they are attended to by the most inexperienced members of the medical staff who uphold a tradition that the three 'Ds (dysentery dyspepsia and diabetes) require medical treatment and the three Hs (hæmorrhoids hydrocele and hernia) are suitable patients to be sent to the surgical wards very valuable clinical material is often missed The result is that it is only too common to find a dyspeptic patient in southern India who has travelled from clinic to clinic and swallowed bottle after bottle of bismuth or alkaline mixture without obtaining relief from his chronic malady Early in 1922 with the assistance and co operation of the President of this Association who was then superintendent of the hospital a special clinic was started in the out patient department of the General Hospital Madras to which all cases complaining of chronic dyspepsia were referred We very soon realized that we were dealing with a very common disease and since that date 1 396 patients have been treated in our surgical wards for gastric ulcer

Except for a few points which are specially applicable to the practice of surgery in the tropics, I do not propose to discuss the signs symptoms and treatment of these diseases since they are well known In India it is not I think sufficiently recognized that if a patient suffering from a gastric or duodenal ulcer is given complete rest and a low diet he will unless advanced stenosis exists be entirely free from symptoms within a few days Recurrence usually occurs sooner or later as a result of injudicious dieting, excessive mental or physical strain or exposure The relapsing nature of a gastric ulcer is its most constant characteristic and a history of repeated attacks of dyspepsia with free intervals is of the greatest value in

TABLE II—*contd.*

	Number of cases.	Percentage.	Operation mortality.
Evidence of diseased appendix.	353	62 per cent	
Thread worms in appendix	353	28 „	
Pyorrhœa or diseased teeth	66	88 „	(Not noted in later cases)
Syphilis	66	4·5 „	
Average weight ..	300	84 lbs.	
Average duration – Duodenal ulcers ..	245	3 years.	
Average duration—Gastric ulcers	30	6 „	
Average duration—Cancer stomach ..	9	2½ „	

Our patients come from all races and castes. It is remarkable how closely the figures of the different population groups in the census report correspond with the hospital admission rates and the distribution of gastric ulcers. The disease is not confined to any one district in the Presidency and the beggar, the coolie, the rich man, the scholar and the agriculturist are all numbered amongst its victims. The Mission Hospitals at Neyyoor and Miraj, with their better supervision of out-patients by surgeons like Pugh, Wanless and Somervell, have for many years been treating these diseases and their published statistics gave the impression of a prevalence in Travancore and the Deccan, which is not correct. Women do not so readily resort to hospital as men and can more easily undertake the simple treatment and rest which will cure the disease in its early stages. They are, moreover, less subject to strain and exposure and, I think, on the whole, their teeth are better preserved. The slightly smaller incidence (1·2 per cent) amongst Mohammedans is probably explained by the more balanced diet of the better classes.

The usual views held as to causation, which for convenience I would classify as mechanical, gastric acidity, intestinal stasis and infection, do not, I think, explain the universality of the disease.

1. *Mechanical.*—The food of the rice-eating Indian is bulky and highly spiced, while chewing of betel-nut or tobacco mixed with a caustic chunam (calcium hydrate) is extremely common. It is held that there are two factors, an irritating food causing hyperæmia of the mucous membrane and a bacterial toxin from teeth

The records of 1,234 hospital patients (Table I) and a more detailed investigation of my own 468 cases (Table II) throw, I think, some light on the ætiology of the disease in India.

TABLE I.

Race and Caste Percentage of Gastric Ulcers

Caste.	Madras Census 1921	Admissions to General Hospital for 8 years 74,314 patients	Gastric and duodenal ulcers 1,234 patients
Hindus	90 05 per cent	74 4 per cent	1,112 or 90·1 per cent
Indian Christians .	3 2 „		45 or 3 6 „
Mohammedans	6 7 „	6 05 „	68 or 5 5 „
Europeans and Anglo Indians	0 05 „	19 6 „	9 or 0 8 „
Men	..	76 per cent	1,186 or 96 per cent
Women	..	24 „	48 or 4 „

TABLE II.

Sites of Ulcer and Associated Conditions.

	Number of cases.	Percentage	Operation mortality		
Duodenal ulcer ..	398	85 1	Gastro enterostomy		7 3 per cent
Gastric ulcer ..	33	7 2	Gastro enterostomy	36 cases	9 4 „
			Excision of ulcer	4 „	0·70 „
Gastric and duodenal (multiple) ..	15	3 2	Partial Gastrectomy	8 „	25 „
Cancer, stomach ..	9	1 9	Gastro enterostomy	3 „	2 died.
			Gastrectomy	1 case	1 died
			Laparotomy	2 cases	No deaths
			Jejunostomy	1 case	1 died.
Leather bottle stomach ..	1	..	*Nil.*		
Jejunal ulcer ..	11	2·3	Ulcer excised	3 cases	
			Anastamosis undone	3 „	
			Further anastamosis	2 „	No deaths.
Perforated duodenal ulcer	3	0·65	....		30 per cent

taken of other parts of the intestines. I would regard this rather as evidence of some general defect, which is involving the whole of the intestinal tract. Somervell has noticed in about half his cases a chain of enlarged lymphatic glands extending from the appendix up the ileocæcal arterial chain to the region of the duodenum, but I have not confirmed his observation. Advanced pyorrhœa or decayed teeth are present in the great majority of Indian patients. In my first series of cases I noted that 82 per cent of patients' teeth were definitely infected, but diseased teeth are so common that we have not collected further statistics. Rosenow's experiments with streptcoocci. isolated from ulcers, are well known and strongly support a theory of infection. Infection from the teeth or other foci in tonsils or elsewhere must be held responsible to a large extent for the incidence of these diseases, but does not explain its universality. Only 4 per cent of my series gave a strong positive Wassermann reaction as compared with 26·9 in 672 consecutive admissions into the surgical wards. Two patients, one a leather bottle stomach and the other a recurring jejunal ulcer, were undoubtedly specific and recovered rapidly with appropriate treatment, but infection of the gastro-intestinal tract is a rare lesion in syphilis.

I think the correct way to consider the stomach and duodenum is not as a muscular food receptacle, liable to irritation and injury, but as a glandular organ susceptible to disease and degeneration as are the other organs of the body. McCarrison in his work on deficiency diseases has shown that while attention has been directed to the grosser lesions due to a vitamin deficiency these are preceded by others, often overlooked but always present. Indigestion, gastric atony, inflammation of the bowel, loss of resistance of the mucous membrane to infection are common early symptoms. Papperheimer and Larimore in 1924 recorded the occurrence of gastric lesions in 55 per cent of rats fed on synthetic diets, in which the only known deficiency was want of vitamin 'A.' McCarrison has recorded the presence of enlarged abdominal glands in monkeys fed on a deficient diet. More recent work suggests that the healthy gastro-intestinal tract is dependent on an adequate supply of all the vitamins A, B and C as well as other essential constituents. It is not in my province to enter into a discussion on the value of vitamins in food but it is well-known that a tapioca diet is deficient in vitamin B, while the diet of the rice eater and of the ordinary European is none too well balanced and generally deficient in essential vitamins in relation to its other constituents.

My opinion is that these gastric and duodenal ulcers occur amongst every race and caste in southern India and that while the food of each differs materially, the common factor is a vitamin deficiency. This deficiency is shown by a degenerative hyperæmia and other changes in the appendix, while focal infection and infected teeth are the final agents which produce ulceration in a stomach or duodenum of lowered vitality. I do not think that these are new diseases. I have not been able to carry out a very detailed search for proof of this statement, but have found descriptions of what must have been pyloric *stenosis* in old medical reports. Furnell in a report of the Madras Hospital 1877 noted that 'dyspepsia is quite common in

or other source This is the view, which is held by many doctors in Madras, but it does not explain the susceptibility of every race and caste A wound made in the stomach during operation or a crushing by clamps will we know rapidly heal even in the presence of hyperacidity, while a short period of rest and low diet will always cure the common dyspepsia to which every one is liable

2 *Gastric acidity* —An attempt to use the fractional test meal rapidly emptied my wards At one time the conventional Ewald test meal was given to all gastric patients but the help obtained in diagnosis was not very striking and these routine examinations never popular with patients were discontinued So far as it is permissible to draw any conclusions from such a small number as 151 examinations our results showed that free hydrochloric acid was not markedly increased either in duodenal or gastric ulcers An analysis of 28 normal cases (mostly students) gave 0 1 per cent of free hydrochloric acid as an average figure for Indians but whereas 29 per cent of normal controls had over 0 1 per cent of free hydrochloric acid only 41 per cent of duodenal ulcers gave a percentage above this figure This was not an emphatic increase In 55 per cent of gastric ulcers (20 cases) the hydrochloric acid was over 0 1 per cent that is an increased acidity occurring with a little greater frequency than in duodenal ulcers My own view is that while excess of acidity may help to maintain a vicious circle it results from the ulcer which is present and can be produced by any chronic irritation of the gastric glands It is well known for instance, that excessive tobacco smoking can produce a high acidity and all the symptoms of an ulcer

3 *Constipation* A few years ago some of us in India were startled by an article on the subject of intestinal stasis which appeared in the *Indian Medical Gazette* (1921) It is true that constipation is very rare indeed amongst the masses of India but the conclusions of the author that as a result of their superior bowel hygiene diseases like duodenal and gastric ulcer and cancer very rarely occur does not at all agree with the experience of doctors in southern India An investigation of 850 cases of cancer treated at the General Hospital Madras in the last 8 years shows that the incidence of malignant disease amongst Hindus and Mohammedans was rather higher than amongst Europeans and Anglo Indians during the same period Dr Somervell finds gastric disease more common amongst the inhabitants of north Travancore and Malabar especially the poorer classes who are eaters of tapioca and not of rice He remarks that all tapioca eaters are constipated Constipation however, which is more common in women than in men is very rare among our Madras patients and their intestinal evacuations are as regular as those of Col Halliday's unsophisticated Indian ryot A theory of intestinal stasis will not explain the universality of the disease

4 *Infection* —In 353 cases in which the appendix was removed during the operation for gastric or duodenal ulcer evidence of disease was found in 218 or 67 per cent I am sceptical of the true meaning of these figures and I believe that in nearly every appendix carefully examined by a competent pathologist, evidence of disease will be found, as I think it would also be found if numerous sections were

one is operating for severe hæmorrhage from the duodenum as the ulcer is so small it often cannot be palpated.

In these cases also transfusion of whole blood is often the only measure that enables a case to be operated on.

There is no doubt that excision of gastric ulcers and gastrectomy gives a smoother convalescence and better results than gastro-enterostomy. My objection to this operation is that there is a very extensive loss of the gastric mucosa and a diminution in the size of the stomach which must require the patient to lead a permanently altered life so far as the size and quality of his meals is concerned. It must profoundly alter the physiology of digestion and, therefore, I still continue to do gastro-enterostomy in the majority of cases. I am tending more and more to give up clamps, as they are difficult in some cases to apply unless the stomach will come well forward and there is the satisfaction of knowing that all hæmorrhage has been satisfactorily stopped if they are not used. In any case I loosen the clamps temporarily to satisfy myself that hæmorrhage has been stopped on the posterior suture line and tie off the vessels in the anterior margins.

The only death from peritonitis I met with was due to a loop of intestine being nipped in the rack of the clamp and the damage being overlooked.

I still use the Fowler's position, but lower the patient to a horizontal position if there is vomiting.

I am doubtful if gastric ulcer is the common cause of cancer of the stomach as most common cases do not give a history of long-continued dyspepsia and ulcer. The Mayos Clinique have demonstrated malignant changes in the margin of ulcers, but I do not think their findings have been generally accepted.

Lieut.-Col. Sir F. P. Connor, I.M.S. (Bengal): Congratulated Col. Bradfield on bringing this important subject before the Congress. The idea that appendix troubles, gastro-duodenal ulcers and cancerous lesions of the bowel are almost unknown in India is quite fallacious. As hospital treatment becomes more popular and operative surgery more acceptable, we are realizing that these pathological conditions are by no means uncommon.

The belief that a regular action of the bowels is a panacea against appendix troubles, gastric ulcers and cancer production is not borne out by experience in India.

Dr. R. H. H. Goheen (Bombay): The importance of the recognition of peptic ulcer is rightly emphasized in Col. Bradfield's paper inasmuch as cancer of the stomach is by no means rare and in the West cancer is generally believed to develop from ulceration. In the general hospital in western India with which I have been associated, the stomach is more frequently effected by carcinoma than any other organ, although the uterus, the breast and the mouth are all very close followers. Cancer of the stomach is recognized in India usually too late for radical removal. The inference is obvious.

Duodenal stasis caused by pressure on the duodenum by the superior mesenteric artery (made abnormal by inflamed glands and periadenitis or by ptosis of the cæcum) is a condition that we are finding to be not uncommon and a condition that gives symptoms very similar to peptic ulcer. Duodeno-jejunostomy gives relief and is easily performed.

European and Indian patients, the principal causes are the use of indigestible food excessive eating and drunkenness' The large number of patients admitted into the medical wards in former days is also suggestive

In order to test the theories which I hold as to the causation of gastric and duodenal ulcers, a special investigation has recently been started in the surgical department of the Madras Medical College with the advice and collaboration of Col McCarrison The effects of deficient or unbalanced diets combined with infection by streptococci and other organisms will be watched on animals and I hope the experiments will provide an interesting example of the value of an association between clinical and laboratory workers

DISCUSSION

Lieut Col W I Harnett I M S (Bengal) Col Bradfield s paper was most timely as the view that Indians were immune from gastric ulcer appendicitis and carcinoma by reason of the rarity of constipation amongst them had obtained wide currency and this debate would have the excellent effect of giving even wider currency to the facts which proved that the views in question were totally wrong

There were several points in Col Bradfield s paper which he would like to discuss The speaker, too had noticed that the proportion of cases in which the percentages of free hydrochloric acid in the gastric juice was raised was quite small, one rarely saw the high acidity figures which in England were regarded as characteristic of duodenal ulcers the common finding being about 0 1 per cent In his opinion this was due to the fact that in India one s patients come so late in the course of the disease that fibrosis and stenosis had occurred, with concomitant atrophy of the secreting glands of the gastric mucous membrane This was corroborated by the large number of cases in which the radiologist found evidence of retention of the barium meal The majority of cases of duodenal ulcers appear to be in the chronic stage by the time they reach the surgeon These facts have an important bearing on the after treatment as cases of stenosis in which there is no active ulceration do much better after gastro-enterostomy than active cases with high hyperacidity In the latter class of cases it is necessary to continue careful dieting and neutralization of acidity by means of magnesium hydroxide or similar preparations for many months for fear of the development of gastro jejunal ulcer Such supervision would be very difficult in India and fortunately it is not often necessary as the majority of cases, for the reasons I have suggested above, obtain complete relief from gastro enterostomy

Lieut Col I H Proctor, I M S (Bengal) Judging by medical boards and sick certificates duodenal and gastric ulcer is one of the commonest diseases in Bengal I agree with Col Bradfield in the field of utility of fractional test meals but as part of pre operative treatment every patient has to learn to swallow a stomach tube in case it is necessary to wash out the stomach after operation

We always use splanchnic analgesia and find it a great advantage (technique described)

It is a standing rule not to do a gastro-enterostomy unless there is a demonstrable lesion I make one exception to this rule and have no reason to regret it, namely, when

patient on whom I operated some four years ago returned a year later (in perfect health) with five brothers and cousins all of whom had the symptoms of duodenal ulcer, and who all showed marked and indurated ulcers on operation.

The disease is commonest within ten miles of the sea, and appears to be almost unknown in the hills. This seems to indicate that fish does not provide the vitamins necessary to prevent the ulceration. Among 540 cases reported on in these remarks, we have only 20 cases of gastric ulcer, of these, five cases are from the Tinnevelly district of British India. Among the remaining 520 cases of duodenal ulceration, only two cases are from the British side, and there is no doubt that in the Tinnevelly district duodenal ulceration is almost unknown. In this district, the people usually eat rice and are not constipated ; in Central Travancore they eat tapioca and are constipated.

The poorest people are by far the greatest sufferers, as is shown by Table I, and they almost invariably are tapioca-eaters who have practically no additions to their diet of tapioca.

We may then consider that tapioca-eating, constipation, and poverty are predisposing causes ; it remains only to consider how these causes act, and whether there are other factors at work.

Betel chewing. This is common all over Travancore, among eaters of rice as well as tapioca, among men as well as women ; yet very few rice-eaters and very few women get duodenal ulcers. I am convinced that it has nothing to do with the ætiology.

Hot spices and curries, if they caused ulceration at all, would surely cause gastric, not duodenal, ulceration ; again all over the extreme south of India, on the British side as well as in Travancore, the same sort of curries are eaten ; yet in certain areas such as the Tinnevelly district, duodenal ulceration is almost unknown, while in the Quilon and Karunagapalli districts of Travancore it is almost a universal complaint among the lower classes.

Bad teeth get blamed for many diseases, sometimes justly, personally I acquit them from duodenal ulcer.

Appendicitis is, undoubtedly, associated with duodenal ulcer, and in about half my cases I have found lesions in the appendix with definitely enlarged lymphatic glands extending in a chain up past the neighbourhood of the duodenum (which they may influence if they do not actually infect it). Braithwaite of Leeds (*Brit. Jour. Surg.*, 1923, p. 23) considers appendicitis as an almost universal causative agent in the production of duodenal ulcer. It may be so in England, but I am sure we are up against something in Travancore which is different from the duodenal ulcer of Britain, and there is little doubt that many cases of duodenal ulceration have normal appendices with unenlarged glands in the ileocæcal region.

In an article on this subject published in the *Journal of the C. M. A. of India*, November 1927, I made the following statement :—

> "I am forced to the conviction that the ætiology of duodenal ulcer is something of the following kind : (*i*) Tapioca diet leads to (*ii*) chronic constipation which leads to (*iii*) appendicitis of a mild order, tending to become chronic rather than acute and involving the lymphatic system draining the appendix region, by extension of which (*iv*) a duodenitis is produced, which may give rise to pyloric spasm and cause a few people to seek relief from this, but more often leads to (*v*) a definite pyloric or duodenal ulceration, causing pain and spasm of the pylorus in the initial stages and stricture later. In

Rai Bahadur Dr Upendra Nath Ray Chowdhury (Bengal) There are, undoubtedly great many cases of gastric and duodenal ulcers which are treated as cases of dyspepsia ' Examination of the test meal does not lead always to a definite con usion and the case needs a very thorough and careful examination before a diagnosis made as one of ulcer I do not agree with the view of Col Bradfield that intestinal asis is one of the causes of ulcer It is, I think, the other way The Indians take a it of vegetables with their meals and their bowels are always more or less free

Dr T H Somervell (Travancore State, B India) Col Bradfield having asked ie to supplement his paper by remarks on my own experience in Travancore during he last four years, I have very rapidly had to get together statistics from my own cases here, in order to attempt to arrive at the ætiology of this ulceration of the duodenum nd pylorus, which is so very common in Travancore Unlike Col Bradfield s cases, ur patients do not correspond at all with the distribution of castes in the census, or in our general hospital admissions

TABLE I

Incidence of Duodenal Ulcer among the Population

	Brahmins	Vellalas	Hindu outcasts	Christians	Mohammedans	Roman Catholics
Total percentage of hospital admissions	2 8	14 8	32 9	26 9	6 4	9 9
Duodenal ulcers	0 9	9 5	71 3	12	4 3	2

From this it will be seen that duodenal ulcer is far more rare in Brahmins and far more common in Hindu outcasts relatively to the total number of cases we deal with here With regard to the districts again, although Neyyoor Hospital is in the extreme outh of Travancore, the patients who suffer from duodenal ulceration almost invariably *ome from the north and central parts of the State, 80 per cent of the cases coming* rom the region of Quilon ninety to one hundred and ten miles from the hospital

This overwhelming preponderance of cases in a certain area and in the lowest lasses seems to point to a possible explanation as to the ætiology The area from which hese patients come is noted for two things especially, constipation and phthisis Moreover, nearly all of the patients have tapioca, not rice, as their staple food Almost very one of our duodenal ulcer patients have marked sometimes extreme, constipa ion, and although only a certain proportion of them (perhaps 5 per cent) have tuber ulosis, yet it seems pretty certain that (*see* Vaile, *Lancet*, 1927 i 721 an absence of fat from the diet is a predisposing cause to duodenal ulceration

*It is certain from McCarrison s work that a diet almost entirely consisting of car*bohydrates will produce atony of the gut and constipation, followed by gastric and duodenal ulceration, in laboratory animals, and personally, I am inclined to the view hat duodenal ulcer is usually a deficiency disease

In the centre and north of Travancore this condition is so common that in many instances every male member of a family has some duodenal or pyloric lesion One

TABLE III.

Operation Mortality during 1921 to 1927.

1. Duodenal ulcers including gastric and pyloric.

Operation.	Number	Died.	Percentage.
Posterior gastro-entero tomy	512	14	2·7
Anterior gastro-entero tomy	5	1	20·0
Pylorectomy, Billroth II	14	1	7·0
Polya	4	1	25·0
Jejunal ulcer, excision, etc.	5	1	20·0
TOTAL	540	18	3·33

2. Gastric carcinoma.

Billroth II	6	1	....
Palliative gastro-enterostomy	4	1	....
TOTAL	10	2	20·0

Dr. S. Subba Rao (Mysore State, B. India): I wish to ask two questions to elicit information.

(1) Are gastro-duodenal ulcers more common in south India than in the north? If so, do chillies play any part in their causation, as chillies enter more freely into the diet of the south Indian than that of his brother of the north?

(2) Col. Bradfield's statistics show very clearly that these ulcers are much more common in men than in women—96 per cent and 4 per cent respectively. That is also my experience. What is the cause of this great disparity in their incidence in the sexes?

Capt. K. S. Nigam, I.M.S. (United Provinces): Supported the view that gastro-duodenal ulcers are fairly common, but they do not submit to operation readily. In operated cases there is no high mortality.

some cases no doubt the appendicitis stage is missed out and the carbohydrate diet leads directly to duodenal ulceration possibly preceded by a 'local duodenitis'"

I wish now to modify this view by adding to its first clause, my conviction that tapioca diet leads so commonly to the series of events quoted because it is deficient in vitamins (especially vitamin B) I thus agree with Bradfield in calling duodenal ulceration a deficiency disease, though I disagree with him in that I am convinced of the fact that constipation is often a part of the disease and that it is more common among the poorer classes than among the well to do and far more common among the Central Travancoreans than anywhere in the Madras Presidency

The ideal of all of us, except perhaps those who charge immense fees for operations is to prevent the disease and the prevention of so widespread a complaint as duodenal ulcer is wellnigh impossible in a land which is so entirely enslaved to custom as is India but we can salve our consciences, as well as benefit our wealthier colleagues by bearing in mind that, if its prevention be difficult yet of all diseases it is one of the most amenable to operative treatment I agree with Sherren when he says Gastro-enterostomy is the most satisfactory operation in the whole field of abdominal surgery Billroth II gastro duodenostomy and such procedures have their adherents and are excellent operations in the hands of those who are skilful enough to do them with safety But for the average good surgeon gastro enterostomy is easy and followed by little risk to the patient

Moreover it often turns a life of constant misery and pain into one which is completely free from pain and discomfort Until more is known of the possibility of preventing this disease we can rest satisfied that we have a cure at hand which is as free from risk as any *abdominal operation provided the necessary precautions are taken*

Appended is a list of the 510 cases on which these observations are based They were all done in the Neyyoor Mission Hospital, Travancore over 150 of them being operated upon by me, and are a series of unselected cases

TABLE II

Sites of Ulcer and Associated Conditions

Situation etc	Number of cases		Percentage	Operation mortality
1 Duodenal ulcer				
Pyloric	171			
Duodenal	188			
Multiple	75			
Pylorus and duodenal	52			
Second part of duodenum	28			
TOTAL	514	514	95·1	3·3 per cent (18 cases)
2 Gastric ulcer		16	2·9	
3 Jejunal ulcer		5	0·9	20 per cent (1 case)
4 Gastric and duodenal		4	0·7	
5 Perforated duodenal		1	0·18	
TOTAL CASES OF ULCER		510		3·4[illegible] per cent (1[illegible] cases)
6 Carcinoma of stomach		10		10·0 per cent (2 cases)

are fibrous, but microscopic appearances of sections (Plate XXIV, figs. 2 and 3) show that they consist of a network of fibrin in which are entangled cells of the mononuclear and hyaline type, endothelial cells and fibroblasts. Some of these adhesions become stretched to form bands, as these consist of young cicatricial tissues which are known to be elastic.

I will now attempt to give some clinical illustrations of these conditions by relating a few cases. I regret the cases are few as I am not at present in the fortunate position of having a good many cases; yet the few that I will deal with. with regard to the clinical and operative findings, may, to some extent, be convincing. Many of these patients did not show any signs or symptoms of amœbic infection though there was a previous history of amœbic colitis, dysentery, etc., but in some of them the laboratory findings directly or remotely indicated amœbic infection: these are my reasons for considering these conditions 'latent amœbiasis.' It has struck me that, by a due consideration of these, many misfortunes of abdominal surgery may be avoided.

I shall now cite types of cases which will verify the pathological conditions described above. For instance, in intestinal amœbiasis, adhesions and bands give rise to kinking of the gut, stasis, sacculation, pouching and dilatation, and in some instances ptosis of the abdominal viscera. I had two cases in the Indian male ward in the Medical College Hospitals in which bands and adhesions caused kinking and displacement of the duodenum and dilatation of stomach giving rise to symptoms resembling those of pyloric obstruction. These patients were considerably relieved by gastroplication and gastropexy, by separating adhesions, removing bands and planting omental grafts to the raw surfaces thus left. The skiagrams of these cases taken after barium meals confirmed clinical findings, namely, pyloric obstruction and gastric dilatation (Plate XXV, fig. 4, Plate XXVI, figs. 5, 6, and Plate XXVII, fig. 7); in these cases the obstructions were of extrinsic origin. In another case in the same ward admitted as a case of acute appendicitis, laparotomy revealed an apparently normal appendix, but coils of intestine and the cæcum were involved in recently formed adhesions and fibrinous bands with flakes of lymph deposited on the surface. All symptoms abated on drainage and continuous irrigation. In all these cases there was a history of recurrent attacks of colitis and in most of them vegetative *E. histolytica* or their cysts were found in the stools, and sigmoidoscopic examination revealed chronic ulcers and cicatrices.

Three other patients (Europeans) presented similar conditions. Radioscopic examination revealed ptosis, kinking, dilatation of the cæcum, sacculation and pouching. All of them had evidence of chronic colitis and vegetative *E. histolytica* and their cysts were found in the stool; they improved considerably on emetine, stovarsol, etc., and injections of autogenous vaccines mostly streptococcic, and also by relieving constipation and using abdominal belts for support with or without pads.

In other cases the symptoms closely resembled those of cholecystitis and cholelithiasis for which they were admitted into the Indian male wards. On

A CONSIDERATION OF SURGICAL COMPLICATIONS OF CHRONIC AND LATENT AMŒBIASIS

BY

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THE pathological changes produced by *Entamœba histolytica* in the tissues depend upon the degree of irritation produced by them and their toxins the damage caused by them and the reaction of the tissues If the vitality of the tissues is irreparably lost there are cytolysis of cells and tissue necrosis if, on the other hand, due to a lower grade of irritation the damaged tissues are still viable there is exudation of plastic lymph and fibrinous material and general tissue reaction as manifested by proliferation of cells

The object of this paper is to study cases presenting the latter type of changes from the pathological and surgical points of view, i e I shall deal with the conditions in which due to the induction of local protective immunity the products of the micro organisms do not prevent coagulation of plasma and destroy tissue

Taking for instance the changes that are produced in intestinal amœbiasis, at first there is catarrh epithelial desquamation and ulceration and later, as the inflammatory process extends through the intestinal wall to the serous coat, there is exudation of plastic fibrinous lymph which due to the adhesive qualities of this lymph (plasma) forms adhesions with the contiguous structures such as the intestine, liver, gall bladder, spleen etc The liability of these adhesions to stretch depends upon the mobility of the structures Thus if adhesions are formed with the small intestine, by virtue of greater peristaltic movements, these adhesions stretch and form fibrinous bands Besides adhesions between contiguous surfaces, amœbic infection may extend to distant parts by the lymphatic route and form adhesions between widely separated structures in the peritoneal cavity The bactericidal power of the peritoneum is proverbial, if it is assumed, and rightly too, that th[illegible] entamœbæ are not the only organisms engaged in this process, but that there [illegible] secondary infecting organisms, this property of the peritoneum evidently [illegible] tributes towards the incidence of local immunity preventing tissue destr[illegible] On the other hand, there are evidences of cell proliferation From a macr[illegible] view of these adhesions and bands (Plate XXIV, fig 1) it would appear [illegible]



FIG 2 A strip of adherent omentum young fibrous tissue plasma cells fibroblasts (Low power)



I Pericolic bands and adhesions in a case of chronic amoebiasis causing fatal intestinal obstruction (semi-diagrammatic)

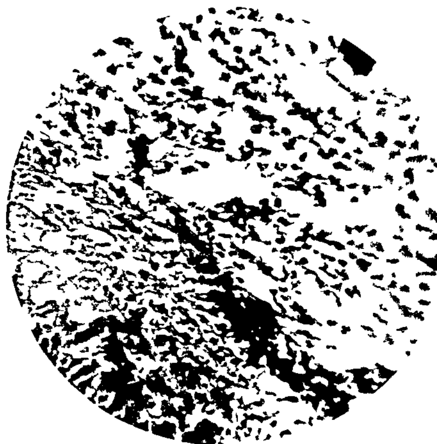


FIG 3 Same as (High

PLATE XXV.

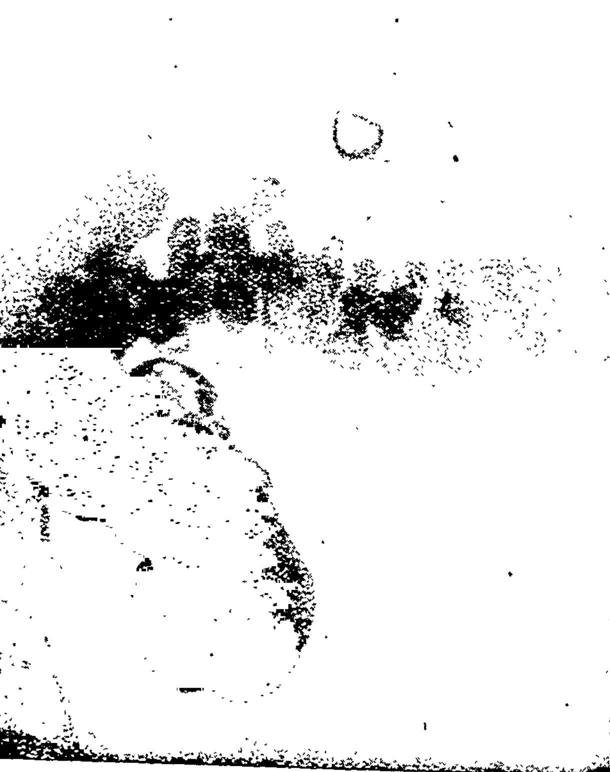
FIG. 4.



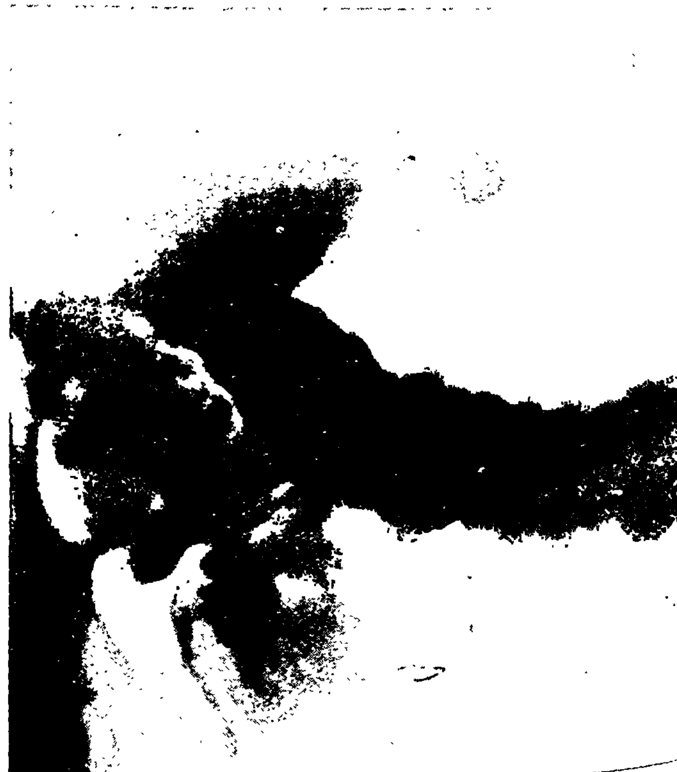
(a)



(b)



(c)



(d)

Explanation of Plate XXVI.

Fig. 5. Barium meal skiagram. Shows ptosis of small intestine.

(*a*) Immediately after: Hyperperistalsis of stomach, indicated by kinks in smallei curvature.

(*b*) 4 hours after: ptosis of small intestine into the pelvis.

(*c*) 24 hours after: delayed filling of cæcum and ascending colon, as they are only partially filled, due to retention of barium in the ptosed small intestine. Transverse colon shows traces of meal only.

[The print of Fig. 5 (*c*), as forwarded by the author, has apparently been inverted.—*Ed.*]

Fig. 6. Barium meal skiagram. (This skiagram is taken after operation.) Previous to operation the skiagram showed dilatation of the stomach, the greater curvature of which extended deep down to the pelvis. Emptying of the stomach greatly delayed. Many bands and adhesions were found between the stomach and the small intestine. Gastroplication and gastropexy were performed.

(*a*) Immediately after meal: obstruction to passage of meal at pylorus, defective filling of duodenal cap; greater curvature of the stomach, much higher level.

(*b*) 6 hours after: still some delayed emptying of the stomach, the plicated stomach has pulled up two loops of small intestine which lay ptosed with it in the pelvis (before operation).

(*c*) 24 hours after: great ptosis of the transverse colon and stasis in the cæcum, ascending colon and transverse colon.

Explanation of Plate XXI

Fig. 1 Barium meal skiagram Shows chronic inflammation of ascen and to some extent of the transverse colon Stasis

(a) Immediately after stomach normal

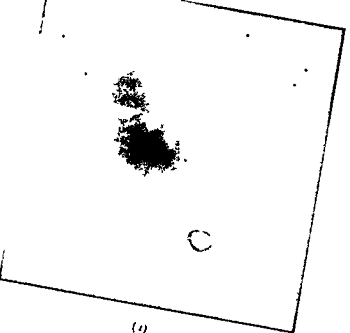
(b) 4 hours after small intestine—normal

(c) 10 hours after cæcum ascending and transverse colon fill noticed with culs de sac and pouches

(d) 24 hours after ascending colon shows presence of meal t colon shows ptosis

PLATE XXVI

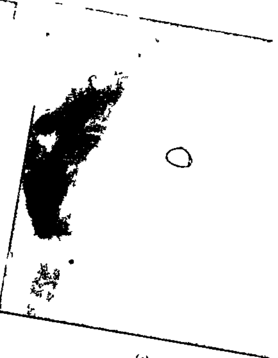
Fig 5



(a)



(b)



(c)

Fig 6







performing laparotomy peculiar conditions were found. In one case bands of fibrous tissue were found on the superior, anterior and inferior surfaces of liver, extending to the gall-bladder, which was small in size and apparently normal (Plate XXVIII, fig. 8). In the other case bands were found extending from the gall-bladder to the duodenum and further down (Plate XXVIII, fig. 9). The patients were completely relieved of their symptoms after the adhesions and bands were removed and the raw surfaces covered with omental grafts. Another patient, diagnosed as a case of cholelithiasis had a lump which on palpation felt uncommonly like a hard and enlarged gall-bladder: on radioscopic examination it was found that there was much ptosis of the colon and the hard mass consisted of the kinked and displaced hepatic flexure of the colon which was thickened and covered with bands. In another case perisplenic bands and adhesions were found extending in all directions, some of them being towards the descending colon and the sigmoid colon. This case was originally diagnosed as 'an abdominal growth (?)' or 'a neoplasm of the kidney (?).' Here, again, all the symptoms disappeared by simply excising the bands and tucking in omentum to cover the raw surfaces. Coils of thickened intestines bound down with adhesions have often been mistaken for intra-abdominal growths (neoplasms) of mesenteric and other origin. I know of one case in which the thickened and adherent cæcum was mistaken for an ilio-cæcal intussusception; the mass was excised and an entero-anastomosis performed. On examination of the excised portion, it was found to be the cæcum with greatly thickened walls and in the mucous membrane were found multiple ulcers, in other words it was a case of chronic amœbic cæcitis and pericæcitis. In many of these cases, the classical symptoms of amœbic dysentery may be wanting; the examination of the stool may be negative to vegetative *E. histolytica* or its cysts, yet there may be vague symptoms of latent colitis. Charcot-Leyden crystals may be found in the stool and blood examination and temperature charts may be helpful. I hold a sigmoidoscopic examination as a routine method in these cases and, if healed and unhealed ulcers and catarrhal, congested or thickened patches on the mucosa are found, I take swabs or scrapings from these parts for examination. It is remarkable how in many cases with negative findings in the stool, *E. histolytica*, with or without other protozoa, can be demonstrated by this method. A radioscopic examination is essential; a serial radiograph after a barium or bismuth meal is useful and percussion and palpation under the fluorescent screen is very often of much help. Cholecystography, presence or absence of jaundice or a history of previous jaundice, the inferences drawn from van den Bergh's test, are useful aids in diagnosis, and, in this connection, hæmoglobinæmia should be differentiated and eliminated.

The pitfalls of abdominal surgery in the tropics are many and these are some of them; it shows how important it is to make thorough clinical, laboratory and radiological examinations and to consider the previous history of the patient in order to make a correct diagnosis and decide upon the surgical procedure.

Explanation of Plate XXVII.

Fig. 7. Barium meal skiagram.

(*a*) Immediately after: stomach—normal.

(*b*) 4 hours after; and

(*c*) 10 hours after: show dilatation and sacculation of the cæcum and ascending colon, evidently due to extrinsic obstruction of hepatic flexure of the colon by bands and adhesions, which is corroborated by very feeble filling of the transverse colon even after 10 hours.

(*d*) 24 hours after: nothing abnormal.

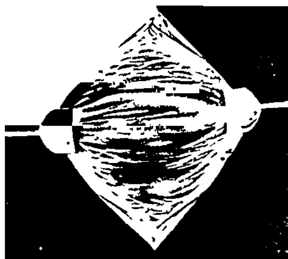


FIG. 8. Bands of fibrous tissue on the superior, anterior and inferior surfaces of liver.

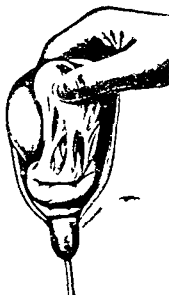


FIG. 9. Bands of fibrous tissue extending from the gall-bladder to the duodenum and further down.

SOME OBSERVATIONS ON THE SURGERY OF TROPICAL DISEASES.

BY

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'Some observations on the surgery of tropical diseases' is the rather comprehensive title that I have put to this paper.

Having regard to the fact, however, that the main fields of tropical surgery, viz., filariasis and amœbiasis, have already been traversed by some of the previous speakers, I propose to confine my discourse to a very simple and practical section of the subject, viz., the consideration of one group of affections due to pyogenic cocci infection, such as abscesses and carbuncles, which all of us meet in our everyday practice.

Abscesses.

Taking abscesses first, the aim is to secure direct primary union wherever possible; or failing that, the quickest secondary union of partly granulating surfaces. The principle is to obliterate or close the serum-oozing weeping surfaces and spaces either (*i*) by *base-encircling, cavity-closing* sutures, or (*ii*) by means of straps applied on or without pads; and where these are not possible, by tight packing. The main points are that (1) the sutures are not to be applied in the ordinary way, but have to be so passed as to go round the base of the raw surface, and, when tightened, to completely oppose the opposing sides leaving no space where serum or pus could collect; (2) the packing is to be fairly *tight*, carefully and thoroughly applied, to leave no open space for the collection of serum or pus, so that when it is gently withdrawn 2 to 4 days later, the cavity is found to be dry and contracted; (3) where strapping may not ensure a complete closure of open spaces, a drain may be left at a suitable dependent part.

The procedure is first to thoroughly wash out the fully-opened cavity of all pus, sloughs and clots and thoroughly and carefully to scrub and cleanse the walls of all slimy coating and deposits of sloughs making them fresh and raw. This is generally best done by gauze which is rough and soft. In case of a scrotal abscess, the thickened tunica may have to be peeled off or scraped with the scoop or knife, according to its affection and attachment. After such cleansing, some abscess floors, as in the case of anal fistulæ, may be further purified by swabbing over with

DISCUSSION.

Lieut.-Col. Sir F. P. Connor, I.M.S. (Bengal): We are pleased to see these examples of possible latent amœbiasis discussed by Lieut.-Col. Chatterji, and the whole question of how much the amœba is concerned in chronic appendicitis and other bowel cases is a very difficult one to solve. It is of such common occurrence that it must complicate many abdominal conditions. As our experience increases we shall, undoubtedly, discover many new and unexpected aspects of amœbic infection of the bowel, but the chief difficulty will be the separation of them from other bowel infections.

sponged with a little spirit. Two or three such dressings applied at intervals of 3 to 4 days and the wound is superficial and practically healed. Needless to say, the operation and the subsequent dressings should be done by the surgeon himself, aseptically with gloved hands.

Carbuncles.

Coming to the treatment of carbuncles, I would detail one method which I have found very useful, quick, painless, inexpensive, efficient and rational. The *aim* is (1) to convert the damp rotten-cloth-like central slough into liquid pus; (2) to widen the narrow tortuous 'alleys' affording little exit to the thick slough and pus, so as to form wider channels allowing freer outlet to the discharge, leaving untouched the active, healthy granulating base to chase out the pus and sloughs; and (3) to destroy no healthy tissue by uncalled for excision; to minimize the pain, expense and the large wound of an operation, which takes a long time to skin over.

The method is as follows :—

General.—Apart from suitable medicinal and dietetic treatment, the carbuncle is to be painted all round, extending well over an inch and a half beyond the margins, with a mixture of equal parts of tinct. iodi and tinct. steel, three times a day to start with and less often later on, as the skin shows remarkable signs of shrinkage under that application, and hot moist thick boric compresses are to be applied 4 to 6 times a day.

Operation.—Pick out the larger of the numerous small openings, measured by the amount of pus which can be squeezed out by very gentle gradual concentric pressure with the flat of the hands round the base. Take a blunt pointed narrow probe, engage it in one of the larger openings and coax its way down along the more or less tortuous passages, avoiding hurt and bleeding if possible, till one feels the moist wool-like slough or can proceed no longer; now rotate the probe gently more and more to enlarge the opening when you will find more pus coming out. Now you may try to go a little deeper and make the alley a little wider. Try this procedure with 4 or 5 points on the first day. Now inject hydrogen peroxide through these widened openings several times and apply a hot thick moist compress.

Next day, you will be rewarded with a considerable amount of pus discharged on the lint and will find the carbuncle distinctly softer. A gentle gradual concentric steady application of pressure with the flat of your hand will discharge a considerable amount of pus from the central slough. Repeat the process for 2 or 3 days, when you will easily be able to pass a pair of narrow sinus forceps along the 'lanes' and widen them into 'roads,' allowing freer discharge of pus. At this stage, injection of a liquid made up of equal parts of salol and camphor, after the injection of the peroxide, is not only antiseptic but soothing and helps in the loosening of the sloughs. In a week's time, the skin is found loose over a soft abscess cavity, largely filled with liquid pus. A little joining up here and there of the openings, with a

tincture of iodine which again, it should be remembered, tends to increase the serous oozing by re action on the tissues Having thus thoroughly cleansed the cavity of foul contents and the walls of unhealthy deposits, the cavity is now to be closed up Where no important blood vessels or nerves are likely to be involved or injured by the base encircling suture, e g , in many subcutaneous spaces on the trunk and limbs and in the buttock and specially in the case of anal fistulæ the whole of the opened up, cleansed and scrubbed red and raw abscess floor can be sewn up by say, 2 or 4 main base encircling space obliterating sutures and the skin sewn up by a few deep interrupted stitches These may be removed on the seventh day, or earlier if there be signs of pain and tension and a couple of straps and the application of a little tinct benzoin co will be all the subsequent dressing that may be needed

If it be a very big deep abscess e g on the thigh round the bone the whole cavity can be strapped up at places applied on pads to secure closer apposition, and applied obliquely with a drain at the most dependent part and the size of the wound can thus be considerably shortened Where it is a deep cavity, as in the case of an iliac abscess or of an amœbic hepatic necrosis commonly known as 'liver abscess' careful tight packing gives the most satisfactory results

The much condemned open operation of liver abscess rightly earned oppro brium because with perhaps two big tubes draining a partly evacuated cavity the latter was left open to secondary infection and offered an excellent culture medium for it If, however, we deal with a hepatic necrotic cavity in a clean frank and straightforward way by this 'close' method the result is most gratifying I am speaking of big abscesses which need repeated aspiration and irrigation Simultaneous subcutaneous injection of emetin is of course a *sine qua non* Just a little detailed mention of this method here may be of some interest Through the rib resected opening held apart by flat retractors the cavity the end of which cannot at first be reached by the exploring gloved fingers is to be well irrigated and cleared out of all pus and sloughs by warm saline, aided by the fingers gently detach ing and loosening them The peculiarly stretched and expanded cavity of the 'abscess' at once contracts remarkably till one can feel the limiting wall on all sides and the gentle detachment of loosely attached sloughs become easier When the outflow of the irrigating fluid comes out quite clear, the cavity is packed with moist gauze wrung dry which when pulled out, brings away the remnants of small sloughs attached to it This process may be repeated The cavity is again packed with gauze soaked in quinine solution and after a little while this pack is pulled out Finally, the cavity is tightly, carefully and thoroughly packed, i e , 'closed' with moist plain gauze wrung dry, leaving no open space inside for any exudation to collect

When the case is dressed for the first time on the third or fourth day, one finds a dry clean cavity, very much shrunk in size Further washing may not be necessary , but the gauze should be changed and the skin round the wound

SURGERY FOR THE RELIEF AND CURE OF ENDEMIC ASCITES.

BY

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THE marked prevalence of endemic ascites in India and the continued reticence of medical writers about this subject serve as an excuse to me to bring this disease and its possible surgical methods of treatment to the notice of the representative body of medical men assembled at this Congress of the Far Eastern Association of Tropical Medicine.

There exists in the tropics a definite disease, endemic ascites, a definite clinical and pathological entity, characterized by a collection of free fluid in the peritoneal cavity, progressive emaciation, a lingering course, and ultimately death in the great majority of cases. This type of ascites is quite distinct from others due to multifarious causes, e.g., tuberculous peritonitis, or due to portal circulatory obstruction, or to parasites, like hydatid disease, or to malignant growths of the peritoneum or viscera. Endemic ascites is found all over India.

The disease affects both sexes of any age, caste or profession, though relatively more males present themselves for treatment (a common Indian characteristic). The most common age lies between 35 and 45 years. No particular occupation predisposes; there appears a suggestion that this disease mostly affects the people living in rural areas where there is a likelihood of fæcal contamination of the water-supply. The agricultural labourer and the cooly class are mainly encountered in hospital practice. Persons belonging to the upper classes of society have been known to suffer. A husband and wife living together in one instance simultaneously suffered from this condition and died one after the other within three years' time, while the younger generation staying with them remained unaffected.

Conflicting views are held regarding its primary cause. There is slow fibrosis of the peritoneum due to an unknown factor x. This factor x may be a toxin circulating in the blood or else an organism too elusive to control in cultures.

sharp pair of scissors and the application of moist pads of lint (not wrung dry) helps in the automatic separation of sloughs and the exposure of a beautiful granulating base. The repeated application of a hot compress is no longer necessary. Nature now does everything—all that is needed is a mere changing of the moist pads daily or even every other day. This treatment is suitable for *cases where the operation of excision or free incision be not urgently called for to* avert the fatal end of a deep septicæmic process.

TABLE I.

Giving the Age Distribution and Occupation of 20 Cases of Endemic Ascites.

Number of Cases.	Age.	Number of Cases.	Occupation.
1	16 years	4	Household work.
3	22 to 25 years ..	12	Labouring class from villages.
4	30 to 35 " ..	2	Cooly in grain shops.
6	35 to 40 " ..	2	Petty traders (one sweetmeat seller and other a painter).
5	40 to 45 " ..		
1	60 " ..		
TOTAL	20	20	

TABLE II.

Giving the particulars about Residence, Mode of Onset, and Family History of the 20 Cases of Endemic Ascites.

Residence.	Mode of Onset.	Family History.
Irregularly from all over the Province.	Slow and insidious, may be termed rapid in two cases where following a short febrile attack the heaviness in the abdomen (ascites) appeared in 10 days' time	Of no particular importance. In practically all cases except one where the husband and wife suffered from the disease, no other members of family were reported to have had it.

History of Previous Illness.—Five cases gave a history of antecedent trouble of the nature of dysentery, frequently of stools with griping and mucus in them. Four cases gave history of having had antecedent attacks of ague and enlarged spleen. One case stated that he had scanty and difficult micturition, though no gonorrhœa was present when he came under care. The ten remaining cases gave no history of antecedent trouble.

PATHOLOGY.

The fluid is of the nature of a transudate. It is thin, straw-coloured and alkaline in reaction. The specific gravity lies between 1003 and 1005, with traces of albumin, about 0·2 per cent. In some cases one leucocyte (very frequently belonging to the large mononuclear type) is seen in every other field of microscope under the $\frac{1}{12}$th oil immersion lens as viewed in a slide prepared from the

Col C A Sprawson I M S, designates this disease in a most expressive way as chronic superior peritonitis, because the peritoneum covering the liver spleen, and upper half of the abdominal cavity is mainly affected

Col J W D Megaw, I M S, considers it a chronic bacillary (dysenteric) peritonitis Other causes given have been *tuberculous peritonitis, sub infections* from the bowel perihepatitis and perisplenitis Some of the cases that have come to me for surgical treatment gave a history of gastro intestinal disorder of varying intensity preceding the onset of ascites This disorder may be of the nature of diarrhœa dysentery constipation or simple colic in the upper part of abdomen with or without nausea and vomiting In other cases there is history of febrile disorder with or without enlarged spleen immediately preceding the onset of ascites In others still the patients stated that they noticed the swelling of the abdomen as the first abnormality and that the departure from health started therefrom Dysentery in India is a very common disease and in the majority of cases the affected people get well without much in the way of treatment A popular remedy is *dahi* (sour milk) and bael fruit (*Ægle marmelos*) which latter is strongly astringent The use of astringents, with or without opium, blocks up the intestinal contents and the toxins thus pent up lead to an absorbed and chronic pericolitis This, in ill managed cases culminates in chronic peritonitis and resultant ascites This is the view of Col Megaw

If the dysentery group of bacilli or their toxins are responsible for ascites, we would very frequently expect to see cases of mild peritoneal effusions more or less amenable to treatment Our experience shows that when effusion in the peritoneal cavity has occurred, it becomes practically incurable in a large *percentage of cases In the most serious cases of dysentery of bacillary origin*, we do not get even slight ascites though the cases may terminate fatally In all cases coming under treatment due care was exercised to exclude such causes as chronic alcoholism gastric or duodenal ulcer, cholecystitis cirrhosis of the liver and chronic syphilitic conditions The Wassermann reaction was tested in five cases where the least doubt in the history existed but it was uniformly negative

The onset course and termination of a case of endemic ascites are typical The clinical picture of a distended abdomen without much or constant prominence of superficial veins thirst, toxæmia and general asthenia being refractory to ordinary methods of treatment is characteristic Guinea pigs injected intra peritoneally with the ascitic fluid or with the blood of markedly toxæmic cases of ascites remained alive and healthy and, even on dissecting them nothing like generalized peritonitis or effusion has yet been met with All these point to the fact that the ætiology of this disease is far from being known. The following facts dealing with the age and occupation (Table I), residence, mode of onset and family history (Table II) and previous illnesses in 20 cases of the disease are of interest in this connection

The rational treatment of this form of ascites is :—(1) To diminish the outpouring of peritoneal fluid, and (2) to provide ample drainage of the fluid back to the body tissues.

In the absence of definite knowledge of the causative factor, the first aim of the treatment must remain unsatisfactory. I have used a mixed vaccine made from the intestinal flora of the patients in five cases with brilliant results in one case. The vaccine was made for me by Dr. J. G. Mukerji. The patient, a young man 25 years of age, was tapped twice before I was consulted. I had a vaccine made for him and though a slight fluid persisted for three months after vaccine injections, he gradually lost it and is still alive and healthy three years after treatment, though for the last six months I have lost sight of him.

Previous Operations.—The following methods of surgical relief has been used for this condition :—

(1) The classical Rutherford Morison-Talma Operation or Omentopexy or Epiplopexy. This aims at establishing a collateral circulation between the portal capillaries (compressed by a cirrhotic liver), and the systemic capillaries, consequently it does not help much in this condition where we want efficient drainage of accumulated fluid. In this operation we merely stitch the omentum to the peritoneum of the anterior abdominal wall.

(2) Schiassi's modification. Splenopexy and omentopexy to the parietal peritoneum.

(3) Mayo's operation : hepatopexy and epiplopexy into the rectus sheath.

(4) Narath's modification : epiplopexy into a subcutaneous pocket in the anterior abdominal wall.

(5) Veno-venous anastomosis between tributaries of the portal vein and systemic veins or tributaries of inferior vena cava.

All these operations come under one category, the aim being to relieve the portal engorgement by allowing an outlet into the systemic capillaries and establishing anastomoses along the adhesions thus produced.

Other operations mainly designed to provide drainage of the accumulated fluid are Lambotte's method and Handley's method. In both of these, drainage by the capillarity of silk threads implanted into the subcutaneous tissues on the one hand and inside the peritoneum on the other.

(6) Lastly, there is Moynihan's venoperitoneal anastomosis, using the internal saphenous vein as a drainage tube. All these operations provide insufficient drainage. The channels along which drainage is supposed to be established may get blocked up by fibrosis and adhesions.

I have had exceptional opportunity of getting all the cases agreeing to surgical treatment for this condition sent to me by the physicians of the King George's hospital. Needless to say, patients only submit to surgical interference when all other possible treatment had proved futile, and many of the cases are desperately

centrifugalized ascitic fluid In other cases red blood corpuscles are probably due to a puncture wound. By the Dreyer technique, agglutin were carried out for me in three cases by Dr J G Mukerji, reader in Lucknow Medical College, with results negative to the dysentery group It is, however, a known fact that agglutinins against the Shiga Flexner bacilli do not persist in the blood for any great length of time Injected dose intra peritoneally in guinea pigs, the fluid gave negative result markedly toxæmic case, I injected 4 c cs of the patient's blood fro intra peritoneally into a guinea pig with no result The guinea pig rema and healthy for long time afterwards Arrangements are being made these experiments on monkeys The peritoneum shows a mil appearance, particularly in the upper half of the abdominal cavity In I pealed off in large strips a thick layer of organizing plastic lymph from surface of the peritoneum. The peritoneum on section shows simple fib this examination, I am also indebted to Dr J G Mukerji The extra tissue in the anterior abdominal wall shows in the majority of cas engorgement and suggests strongly the reaction to some circulating toxi terial or protozoal origin

Blood counts show in a majority of cases a tendency to leucopenia between five to seven thousand per c mm of blood and no characterist changes

The effusion of fluid in these cases is due to chronic periton degenerated and fibrosed peritoneum filters off the fluid from the engorg peritoneal capillaries while it loses its absorptive power Thus dehydrati tissues occurs and explains the clinical picture of the thin face and limbs, *protruberant pot belly Later on, the fibrosed peritoneum contracts on* tained viscera like the liver and spleen No intra hepatic fibrosis has been in such cases The functions of the liver, however, get hampere compression of the organ due to the contraction of the fibrosed peritoneal in The liver in advanced cases thus becomes incapable of neutralizing the c toxins in the blood and toxæmia consequently results This also i necessity of early operation in such cases when best results are obtained

Operative Treatment

Indications for Operation —In all cases of endemic ascites where treatment carried on for a reasonable period, say six weeks, shows no effec cases, an operation for establishing peritoneal drainage should be un when the results will be uniformly satisfactory In advanced and toxæmic cases which unfortunately fall to our lot, no brilliant results can b by any operation Six out of my twelve operated cases belonged to category, but though my anæsthetists apprehended heart failure during th tion, they all stood the laparotomy well, with no immediate mortali patient died six days after the operation from extreme general exhaustion

(*f*) The peritoneal cavity is drained for five to six days by a fine rubber drainage tube stitched through the lower part of the abdominal incision. The rest of the incision is then closed up by stitching in layers. Drainage should be avoided in very weak subjects.

The time taken amounts to 30 minutes in all. No severe shock is produced and patients get their wounds healed up in ten days' time.

This procedure may be repeated on the other thigh after a month, or the patient may come later on for further operation if necessary.

Out of twelve cases that I have operated on for endemic ascites, during the last two years, eight have been done by this method, and have been discharged relieved of their symptoms. One died of extreme exhaustion.

ill When in these adverse conditions one ventures to cover new ground one is seriously handicapped Owing to repeated failures by some of the above mentioned methods, the following technique was started by me which promises better results

AUTHOR'S OPERATION

Aims of the Operation —To provide free drainage by putting in a huge drainage tube made from the patient's own tissues and anchoring it into the peritoneal cavity These tubes, being made from autogenous sources are less likely to irritate and will thus not get blocked up by reactionary inflammation

Short Details of the Operation The operation is performed in two stages to avoid too much shock by the long exposure of the peritoneum in an already weak individual

Stage 1 *Formation of Fascial Tube* (*a*) The patient is put under an anæsthetic, a twelve inch long incision is made along the outer aspect of one thigh beginning from the anterior superior iliac spine and extending vertically downwards

(*b*) A strip of fascia lata is dissected up at least 12 inches by 3 inches cutting it free from below and keeping it pedicled near the upper end of the incision

(*c*) This strip is lubricated with sterilized liquid paraffin and then turned into a tube by using a mould of stiff rubber tube of about one inch in cross section and stitching the strip of fascia lata to it longitudinally, using Chromic gut for this purpose

(*d*) This drainage tube is provided with side holes like an ordinary drainage tube for better drainage

(*e*) The skin incision is closed up by continuous suture with silkworm gut

Stage 2 *Abdominal Incision for establishing Drainage* (*a*) The patient is tapped 24 hours before operation to avoid the bad effects of sudden release of pressure An abdominal paramedian incision is made below the level of the umbilicus of about four inches in length

(*b*) The condition of the peritoneum and viscera are thoroughly investigated

(*c*) The fascial tube already prepared which is in the meantime lying wrapped up in warm moist gauge, is picked up and pulled inside the wound through the subcutaneous tissues from the upper part of the thigh incision and the abdominal parieties above the outer end of the inguinal ligament Care is taken that a sufficiently wide, but at the same time valvular, tunnelling is done to prevent compression of the tube

(*d*) The tube is anchored intra peritoneally by slitting its inner end in a triradiate fashion to prevent its closure, and the lips thus formed are anchored widely apart by Chromic gut sutures

(*e*) Future strangulation of intestine over this band of tube is avoided by stitching the wall of tube with interrupted sutures to the posterior aspect of the anterior abdominal wall

crural et se dirige dans le bassin vers le ganglion rétrocrural interne où il se termine

En résumé, la majeure partie des lymphatiques du gland aboutissent aux ganglions inguinaux profonds le reste se jette dans les ganglions rétrocruraux interne et externe

Comme conclusions pratiques, nous devons retenir

1° que les ganglions inguinaux profonds et les ganglions iliaques externes (chaîne interne et chaîne externe) peuvent être atteints en cas de cancer du gland

2° que par suite des anastomoses qui se produisent au niveau du plexus présymphysien les ganglions des deux cotes peuvent être atteints

Les lymphatiques de l'urethre, au niveau de la verge naissent d'un réseau annexe a la muqueuse uréthrale Ces lymphatiques se réunissent pour former deux groupes de collecteurs un groupe balanique et un groupe pénien

Le groupe balanique traverse la paroi inférieure au niveau du frein et s'unit aux troncs lymphatiques du gland

Le groupe pénien qui sort sur le paroi inférieure de l'urèthre contourne les faces latérales des corps caverneux et s'unit ensuite aux troncs émanés de la partie balanique et par suite aux troncs lymphatiques du gland Quelques vaisseaux passent au dessus de la symphyse entre les deux muscles droits et aboutissent au ganglion rétrocrural interne, autres passent sous la symphyse et se réunissent aux vaisseaux émanés des portions bulbaire et membraneuse et aboutissent finalement

1° a un ganglion situé le long de l'artère honteuse interne,

2° au ganglion rétrocrural externe,

3° au ganglion moyen de la chaîne interne des ganglions iliaques externes

En définitive, les lymphatiques de l'urèthre au niveau de la verge aboutissent surtout au plexus présymphysien et de là gagnent les ganglions inguinaux profonds et les ganglions iliaques externes (groupe interne et groupe externe)

Les lymphatiques des organes érectiles sont surtout connus au niveau du gland nés d'un riche réseau, ils se réunissent aux lymphatiques du réseau superficiel et se confondent avec eux Les lymphatiques du tissu érectile au niveau du corps du pénis vont se jeter soit dans les troncules émanés du réseau balanique soit dans les troncs collecteurs qui accompagnent la veine dorsale profonde

En définitive les lymphatiques des tissus érectiles de la verge aboutissent au réseau présymphysaire, puis aux ganglions inguinaux profonds et aux ganglions iliaques (groupe interne et groupe externe)

Schématiquement, on peut dire que la circulation lymphatique de la verge comporte deux réseaux à terminaisons différentes un réseau superficiel collectant la lymphe du prépuce ou du fourreau, un réseau profond collectant la lymphe du gland, de l'urèthre et des organes érectiles

Le réseau superficiel aboutit aux ganglions inguinaux superficiels des deux cotés le réseau profond aboutit aux ganglions inguinaux profonds et aux ganglions iliaques externes (groupe interne et groupe externe) des deux cotés

LE TRAITEMENT DES CANCERS DE LA VERGE

PAR

LE ROY DES BARRES
Directeur du Service de la Prophylaxie du Cancer en Indochine,

ET

HEYMANN,
Chef du Service de Radiologie et de Curiethérapie de l'Institut du Radium de l'Indochine
Membres de la Commission Ministérielle Française du Cancer

Le cancer de la verge est une affection relativement fréquente au Tonkin où il représente 17 5 pour cent de la totalité des cancers Aussi grace aux nombreux malades atteints de cette affection que nous avons eu l'occasion d'étudier et de soigner, avons nous pu essayer successivement, les uns après les autres les différents procédés du traitement preconisés Notre expérience portant sur plusieurs centaines de cas nous a conduit peu à peu à modifier notre ligne de conduite dans le traitement de cette néoplasie, au fur et à mesure des traitements utilisés, aussi nous a t il paru intéressant de communiquer aujourd'hui le mode de traitement auquel nous nous sommes actuellement arrêtés Quelques considérations générales sur le cancer de la verge nous ont paru nécessaires avant d'aborder sa thérapeutique Nous ne parlerons ni de l'étiologie, ni de la symptomatologie, ni du diagnostic du cancer de la verge mais nous estimons indispensable pour expliquer le choix des méthodes préconisées de rappeler, sommairement, d'une part la circulation lymphatique de la verge et d'autre part l'anatomie pathologique de cette affection

En cancérologie la connaissance exacte de la circulation lymphatique des organes et de l'anatomie pathologique des tumeurs est primordiale, car de ces connaissances découlent toutes les indications thérapeutiques, le cancer de la verge n'échappe pas à cette règle

I CIRCULATION LYMPHATIQUE DE LA VERGE

Sans faire une étude complète des lymphatiques de la verge qui ne saurait entrer dans le plan de ce mémoire, nous devons cependant rappeler les grandes lignes de la circulation lymphatique de cet organe

Ces lymphatiques peuvent schématiquement se diviser en

(ce qui semble confirme) que l'element inflammatoire joue un grand role dans cette adénite (ceci n'a rien d'etonnant etant donne l'état de suppuration dans lequel les malades viennent nous trouver) et que pendant longtemps le cancer de la verge est une lesion purement locale et que les metastases ganglionnaires ne surviennent que tres tardivement C'est d'ailleurs l'avis de nombreux medecins Ferrari et Viallet dans un article recent adoptent cette maniere de voir (1)

Nous verrons plus loin le resultat des examens histologiques ganglionnaires que nous avons fait pratiquer

Parfois cependant des le début les ganglions lymphatiques sont envahis c'est ainsi que nous avons observé un malade chez lequel les ganglions iliaques avaient presente des les premiers mois une metastase neoplasique

Au point de vue microscopique les cas de cancer de la verge que nous avons traites se presentaient sous les deux formes d epithelioma spino-cellulaire (cas le plus frequent) et d epithelioma baso-cellulaire a globes *cornes parakerato*siques (epithelioma mixte) Histologiquement comme le dit *le professeur* Regaud le cancer de la verge doit etre considere comme un cancer cutane

(a) Epithelioma spino cellulaire

Dans le derme existent des masses fortement colorees qui s enfoncent dans la profondeur et sont separees plus ou moins les unes des autres par des ilots et des bandes conjonctives Ces masses ou boyaux disposees en gros bourgeons bosselées et lobules sont formees a leur périphérie de cellules rappelant le type de cellules basales epidermiques et a leur interieur de cellules polyedriques a epines intercellulaires du type des cellules du corps muqueux de Malpighi

Dans l interieur de ces boyaux on rencontre d enormes masses spheriques, ou plus ou moins ovoides, ce sont les globes cornes clas iques par endroits ces globes cornes, par suite de la disparition des cellules du type basale peuvent etre en contact direct avec le stroma Les mitoses sont peu fréquents Ce stroma a une structure variable, le plus souvent inflammatoire, mais parfois fibreuse, ce qui donne a certains cancers de la verge une dureté spéciale au niveau de sa base, il est fortement infiltre de fibroblastes jeunes et adultes et sillonne de faisceaux plus ou moins abondants de fibres collagenes l infiltration polynucléaire et plasmocytique est surtout accusee dans les formes inflammatoires

Ces elements pénetrent parfois dans l intérieur des masses neoplasiques Les vaisseaux représentes par de *nombreux capillaires ectasies, montrent un* endothelium generalement tumefie

(b) Epithelioma mixte ou epithelioma spino baso-cellulaire a globes epidermiques parakeratosiques

Le tumeur est composee d'ilots de toutes dimensions disposes sans ordre architectural, au milieu d un stroma tres infiltré de fibroblastes et de polynucleaires Ces ilots sont formes en grande partie d elements baso-cellulaires, dans certains

Théoriquement, on semblerait autorisé à conclure qu'un cancer envahissant le prépuce ou le fourreau, n'aura de retentissement ganglionnaire qu'au niveau des ganglions inguinaux superficiels, tandis qu'une néoplasie développée au niveau de la portion balanique (muqueuse du gland ou urèthre) infectera les ganglions inguinaux profonds ou iliaques externes et qu'ils en sera de même si la tumeur atteint le tissu érectile.

Mais dans la pratique il faut tenir compte des anastomoses qui relient ces deux réseaux lymphatiques, ainsi que des troncs collecteurs anormaux (d'ailleurs fréquents) qui peuvent suivre un autre trajet que celui que nous avons indiqué.

Les principales anastomoses entre les deux réseaux ont lieu au niveau de la portion balanique du prépuce où le réseau lymphatique du prépuce reçoit les lymphatiques du gland qui sont en communication eux-mêmes avec ceux de la portion balanique de l'urèthre.

Des anastomoses nombreuses existent en outre entre les ganglions inguinaux superficiels et les ganglions inguinaux profonds, mais là en réalité, il s'agit d'une deuxième relai ganglionnaire en ce qui concerne les lymphatiques émanés du prépuce ou du fourreau.

De cette distribution des lymphatiques, il résulte que dans les cancers de la verge, peuvent être pris les ganglions suivants : ganglions inguinaux superficiels, ganglions inguinaux profonds, ganglions iliaques externes et même les ganglions iliaques internes. Cliniquement ce sont ces localisations ganglionnaires qui se rencontrent ; nous devons ajouter que cliniquement encore les cancers du prépuce ou du fourreau s'accompagnent le plus souvent que d'adénites inguinales superficielles, tout au moins pendant fort longtemps, mais que les cancers du gland s'accompagnent par contre assez souvent d'adénites inguinales superficielles en même temps que d'adénites profondes.

Comme conclusion thérapeutique on peut dire que le traitement idéal sera celui qui, outre l'ablation de la lésion primitive, réalisera l'extirpation ou la stérilisation de tous les ganglions susceptibles d'avoir subi une métastase cancéreuse.

II. ANATOMIE PATHOLOGIQUE.

Nous ne décrirons pas l'aspect macroscopique des deux formes du cancer : ulcéreuse et végétante, ni la manière dont progresse la tumeur qui, partie de l'extrémité de la verge, gagne peu à peu la racine et la dépasse. Nous mentionnerons simplement en passant l'intégrité longtemps conservée du canal de l'urèthre.

Cliniquement, pendant une assez longue durée les ganglions paraissent indemnes d'envahissement ; dans 50 pour cent des cas observés par nous ils ne dépassaient que très peu le volume des ganglions normalement constatés chez les Annamites, qui présentent presque tous un certain degré d'adénite inguinale chronique, à la suite des multiples lésions cutanées (gale en particulier) dont ils ont été atteints.

Souvent même, après la disparition de la tumeur, obtenue chirurgicalement ou par les radiations, nous avons vu l'hypertrophie ganglionnaire rétrocéder

ganglionnaires paraissent peu fréquentes dans toutes les premières périodes de l'évolution de la lésion néoplasique, elles le deviennent par la suite.*

La conséquence thérapeutique est que le médecin doit considérer l'envahissement ganglionnaire comme probable même au début et agir en conséquence †

III. TRAITEMENTS.

1° Traitement de la tumeur.

Le traitment est soit chirurgical, soit radiothérapique (rayons X ou radium), soit mixte.

A. *Traitement chirurgical.*

Le traitement chirurgical consiste en l'ablation simple de la tumeur (ce qui n'est possible que tout au début), l'amputation de la verge, l'extirpation complète du pénis y compris le bulbe et la racine des corps caverneux, l'émasculation totale Nous ne décrirons pas les procédés opératoires que l'on trouve dans tous les traités.

Faut-il pratiquer l'évidement ganglionnaire. Nous pensions encore récemment en nous basant sur des examens histologiques incomplets que cette extirpation était inutile et nous les enlevions que s'ils paraissent cliniquement atteints, et dans les cas douteux, nous préférions nous abstenir et pratiquer seulement un biopsie quitte à faire une extirpation secondaire

Les nouvelles recherches anatomopathologiques que nous avons fait exécuter ces derniers temps ont modifié notre opinion, qui l'aurait peut être été plus tôt, si nous avions pu revoir nos malades Mais il est impossible d'obtenir des indigènes qu'ils reviennent dans nos services se faire examiner de temps à autre, et il est également impossible d'obtenir des renseignements sur eux, si bien que nous ignorons totalement les résultats éloignés de nos interventions

A l'heure actuelle nous pensons que l'extirpation ganglionnaire chirurgicale serait à faire, si elle pouvait être complète Or, ce que nous savons de la circulation lymphatique de la verge, nous montre que, pour être véritablement efficace, l'extirpation ganglionnaire devrait porter sur les ganglions suivants : ganglions inguinaux superficiels et profonds, ganglions iliaques externes, ganglions iliaques internes et même ganglions lombaires. C'est dire la complexité d'une telle intervention, qui devrait porter sur les deux côtés, ce qui entraînerait des délabrements considérables

Aussi à part les cas au début, et limités au prépuce, l'extirpation ganglionnaire a-t elle peu de chances de mettre à l'abri des métastases

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* Nous tenons à exprimer ici nos vifs remerciements à MM. les Docteurs Naudin, Lameureux Biblet et Joyoux qui ont bien voulu se charger de nos examens microscopiques.

† Dans une analyse faite dans notre mémoire dans le Journal " Le Cancer " No. 2, 1927, l'auteur de cette analyse nous a reproches avec juste raison de ne pas avoir cru à cet envahissement ganglionnaire.

d'entre eux on trouve de rares cellules du type spino-cellulaire, plus ou moins modifiées, mais sur lesquelles il est encore souvent possible de distinguer les filaments d'union. Nombre de cellules sont en pleine évolution monstrueuse, leur protoplasme est gonflé, vacuolaire, dans certains cas la mort rapide de la cellule rend leur noyau à peine perceptible à cause de la perte de toute affinité tinctoriale. Les mitoses sont abondantes ; elles siègent principalement au niveau des cellules du type basal et sont presque toutes atypiques (noyaux bourgeonnants ou divisés). Par place, dans l'intérieur des lobules formés par les cellules du type basal, les cellules spino-cellulaires s'orientent en tourbillons et donnent naissance à des nodules ou globules épidermiques parakératosiques qui se composent en allant de la périphérie au centre : 1° de cellules à filaments d'union polyédriques à gros noyau central, à nucléoles et à réseau chromatique visibles, mais les noyaux sont irréguliers et prennent des formes exubérantes ; 2° de cellules plus ou moins aplaties, disposées concentriquement au nodule central, en écailles de bulles d'oignon, dont les filaments d'union ont disparu, et sans qu'il existe de surcharge d'éléidine ; 3° de cellules, encore disposées en lamelles concentriques, mais en état de dégénérescence et de fonte en une masse homogène dans laquelle on trouve les noyaux en voie de fragmentation et ayant perdu leur affinité tinctoriale. Dans un cas que nous avons observé il y a quelques années, on se trouvait en présence d'une variété d'épithélioma pavimenteux métatypique un peu spécial ; l'épithélioma pavimenteux intermédiaire, dans lequel les travées épithéliomateuses étaient composées de cellules intermédiaires entre les cellules basales et les cellules spino-cellulaires et les globes étaient soit épidermiques soit parakératosiques. Chez un malade que nous avons eu l'occasion d'observer récemment, les cellules kératinisées avaient conservé leur noyau, plus ou moins altéré.

L'index caryokinétique varié pour l'ensemble des cas étudiés de 1 100 à 1/1.500 (moyenne 1/350). Nous n'avons jamais rencontré l'épithélioma baso-cellulaire pur (épithélioma pavimenteux tubulé), ainsi que d'épithélioma bénin syphiloïde (épithélioma papillaire de Fournier et Darier ou érythroplasie de Queyrat).

D'autre part, si cliniquement nous avons observé des épithéliomas à sécrétion abondante et fétide, d'une bénignité relative, correspondant à la description clinique de l'épithélioma sébacé du pénis, tel qu'il a été décrit par Poncet, Ducos, jamais les examens histologiques que nous avons fait pratiquer n'ont pu donner la preuve du point de départ des lésions dans les glandes sébacées de la couronne préputiale.

Aucun cas de sarcome du pénis n'a été observé par nous.

Les recherches de Degorce(2) avaient établi la rareté de l'envahissement néoplasique des ganglions dans le cancer de la verge (40 pour cent des cas environ) ; cette proportion nous l'avions admise dans un mémoire fait par nous l'année dernière (3) ; mais des recherches récentes, avec l'emploi des procédés de coloration plus perfectionnés que ceux utilisés par Degorce, et surtout l'examen des coupes en série, nous obligent à revenir sur cette opinion, et de dire que si les métastases

Tout d'abord, les aiguilles placées relativement près les unes des autres donnent lieu à un rayonnement secondaire qui malgré la filtration effectuée, pourra provoquer des zones de nécrose des tissus non cancéreux et quoique ces zones soient relativement peu étendues autour de chaque aiguille par leur réunion elles peuvent former une aire de mortification assez étendue susceptibles d amener dans la suite une réaction sclérosante d une certaine importance

Les difficultés de désinfection de la région si l on ne pratique pas l abrasion des parties bourgeonnantes de la tumeur doit également entrer en ligne de compte chaque trajet d aiguilles s infecte et si les accidents septiques sont rarement à redouter l action du radium en est par contre diminuée car comme l a montré Regaud la présence de nombreux éléments microbiens rend plus difficile l atteinte des cellules cancéreuses

De plus cette méthode ne permet pas facilement l utilisation de l électivité qui suivant Regaud se définit ' L'action efficace sur les cellules radiosensibles à l exclusion de toute action nuisible apparente sur tous les tissus généraux '

Or cette électivité est en rapport avec l homogénéité du rayonnement et augmente avec le pouvoir pénétrant Dans la méthode par radiumpuncture ces conditions sont mal réalisées puisque la filtration du rayonnement est relativement faible et de plus le pouvoir pénétrant du rayonnement est mal utilisé

Enfin, si l'on ajoute a ces inconvénients de la méthode la difficulté d'obtenir une répartition égale du rayonnement dans toutes les parties de la tumeur l on comprendra que la perte d'électivité se produira encore plus facilement

De cette perte d électivité résultera non seulement la destruction des cellules néoplasiques mais aussi de celles du tissu conjonctif dont l intégrité représente l'un des modes les plus importants des réactions de l organisme en vue du processus de guérison, ainsi que l'ont démontré Roussy S Laborde et leurs collaborateurs

Le Dr Bablet* qui a bien voulu se charger du contrôle microscopique du traitement chez nos malades nous a remis la note suivante a propos de la radiumpuncture

' L'action destructive sur les cellules néoplasiques apparait irrégulière et inégale Massive et *complète sur certains points (correspondant au voisinage des aiguilles)* elle laisse intactes de larges zones situées en dehors de leur champ d'action et qui constituent des foyers actifs de récidives

' L'atteinte du stroma est généralement précoce et importante elle est révélée par la pycnose des noyaux la thrombose et l oblitération des vaisseaux un peu plus tard par la sclérose L'irritation produite et entretenue par la présence de

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* Le Dr Bablet a employé la technique suivante Dans chaque cas il a été pratiqué 3 à 5 biopsies suivant les indications le Roussy la première avant le début du traitement les autres après celui-ci Les fixations ont été faites au Dubosq Brazil les inclusions à la paraffine les colorations suivant les procédés trichromiques de P Masson

C'est pourquoi nous avons abandonné totalement l'extirpation chirurgicale simple et avons-nous adopté un traitement mixte, quand le traitement chirurgical est indiqué, traitement mixte que nous décrirons plus loin.

Pour la destruction des petites tumeurs, on peut utiliser la diathermie ; pour les tumeurs un peu plus volumineuses l'usage du couteau diathermique est à recommander, mais là encore nous sommes d'avis de pratiquer un traitement mixte.

B. Traitement par les rayons X.

Les divers essais de traitement du cancer de la verge par la radiothérapie seule ne nous ont pas donné de bons résultats, aussi avons-nous renoncé à ce mode de traitement. Nous n'avons pas utilisé la méthode de Coste (applications des rayons X sans filtration en une séance unique). Essayée dans un cas de cancer de la vulve ce procédé ne nous a donné aucun résultat.

C. Traitement par le radium.

Le traitement des épithéliomas de la verge par le radium peut se faire soit par l'implantation d'aiguilles dans la tumeur, soit par appareillage externe.

(*a*) *Radiumpuncture.*—Les divers auteurs qui se sont occupés du traitement des cancers de la verge par le radium, ont eu d'abord recours à la radiumpuncture, c'est ainsi que Ferrari et Viallet à Alger, L. Dean en Amérique, Le Roy des Barres et Heymann en Indochine, ont utilise ce procédé.

La technique consiste à introduire dans la tumeur des aiguilles en platine, contenant soit un soit deux milligramme de radium suivant l'étendue du cancer. Le filtrage que nous avons employé était de Omm 5. Les aiguilles sont toujours autant que possible implantées suivant l'axe de la verge et en opposition l'une à l'autre de façon à pouvoir les maintenir en place par ligature de leur fil, c'est-à-dire qu'une aiguille est entrée de l'extrémité de la verge vers la base, l'autre l'étant de la partie de la tumeur la plus rapprochée de la base vers l'extrémité de la verge. La distance qui sépare les aiguilles les unes des autres est de 1 à 2 cm.

Quant au nombre des aiguilles à employer, il est déterminé par le volume de la tumeur à traiter.

Nous avons employé le plus ordinairement des doses de 15 à 20 m.c.d. en 8 ou 10 jours, de façon à obtenir l'atteinte des diverses générations de cellules proliférantes.

L'application des aiguilles peut se faire dans la tumeur sans que celle-ci n'ait subi aucune préparation. Dans notre pratique, avant l'application du radium, nous procédons à l'abrasion à la curette de tous les bourgeons exubérants de façon à diminuer autant que possible les risques de résorption des tissus cancéreux, puis à la thermocautérisation des surfaces cruentées. Cette manière de faire a l'avantage de réduire le volume de la tumeur à détruire et par suite de permettre l'utilisation d'une quantité moindre de radium.

Cette méthode de radiumpuncture n'est pas sans présenter un certain nombre d'inconvénients.

la prolongation de l'application des radiations permet d'atteindre les uns après les autres les diverses générations de cellules néoplasiques.

Nous avons fait contrôler par le Dr. Bablet les résultats microscopiques obtenus par l'application des appareils externes et il a bien voulu nous remettre la note suivante:

'Voici par contre les modifications histologiques qu'on observe quelques jours après l'enlèvement d'un appareil externe. Dès le 1° jour necrose fibrinoide de la zone superficielle où les cellules tumorales ne sont plus reconnaissables. Au dessous du tissu de granulation, riche en néo-vaisseaux, infiltre de nombreux leucocytes (polynucléaires—lymphocytes- plasmacytes) ou persistent le plus souvent quelques travées néoplasiques disloquées dont les éléments cellulaires, séparés, montrent un cytoplasme altéré, quelques noyaux monstrueux et une majorité de noyaux pycnotiques. L'essaimage, la dislocation des masses tumorales denses semble un fait constant et précède toujours les dégénérescence cellulaires. Celles-ci sont habituellement observées de 10 à 20 jours après la fin du traitement et semblent en relation avec l'activité du stroma qui agrandit les brèches isole les dernières cellules cancéreuses en apparence intactes mais probablement sensibilisées par la curiethérapie et neutralise ces éléments qui ont perdu toute activité.

'En résumé, la curiethérapie continue à doses moyennes, pendant 10 à 11 jours, réalisée par un appareil externe moulé, sur des épithéliomas spino cellulaires de faible activité karyokinétique, altère profondément et détruit le plus souvent définitivement la totalité des cellules cancéreuses, sans toutefois porter atteinte aux propriétés défensives du stroma. La dislocation des travées néoplasiques, amorcée par l'action directe du radium sur les cellules cancéreuses est poursuivie par l'envahissement du stroma que soutient une vascularisation intense et une leucopédèse active. Plus tard l'hyperplasie conjonctive discrète et l'apparition de collagène consolident les résultats acquis.'

Les essais que nous avons faits nous ont donné des résultats les plus intéressants, ous ne pouvons pas parler de guérison, car le recul du temps est nécessaire, mais s considérations théoriques qui nous ont conduit à adopter ce mode de traitement, ont d'accord avec les résultats obtenus en ce qui concerne la destruction des llules cancéreuses, comme l'ont démontré les recherches de Bablet.

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De la comparaison des deux méthodes il ressort nettement que l'appareillage rne est supérieur à la radiumpuncture; l'utilisation de l'appareillage externe net en effet mieux que la radiumpuncture, de suivre les principales règles amentales posées par De Nabias en ce qui concerne le traitement des tumeurs éreuses par le radium à savoir:—

° Attaque du néoplasme par les radiations de la périphérie vers le centre;

° Application curiethérapique continue dont la durée est basée sur l'index ité karyokynétique.

corps étrangers s'ajoute sans doute dans cette méthode, à l'action directe du radium sur les cellules normales du tissu conjonctivo-vasculaire. Les hémorrhagies tissulaires, la leucopédèse et la macrophagie consécutive entrainent une infiltration leucocytaire et une réaction fibroblastique excessive.'

Malgré ces inconvenients, cette méthode mérite d'être retenue pour les tumeurs peu volumineuses et particulièrement pour celles limitées au prépuce; nous lui devons nombre de succès immédiats, nous ne disons pas guérison, car comme nous l'avons déjà signalé, nous ne revoyons jamais nos malades. Nous devons cependant faire exception pour l'un d'eux qui, traité en mars 1926 pour un cancer de la verge, ayant détruit les trois quarts de cet organe, est revenu nous voir ces derniers jours. Son état général est excellent, et au point de vue loca la guérison s'est maintenue complète; il n'existe aucune métastase décélable. Le traitement avait consisté en l'application de 10 aiguilles d'un milligramme de radium (10 milligrammes au total) avec filtration de platine de 0·05. La durée de l'application avait été de dix jours, ce qui donne approximativement 18 m.c.d. Les ganglions qui n'étaient pas hypertrophiés, n'avaient pas été traités. Voici un exemple, après 19 mois, d'un résultat obtenu par radiumpuncture.

(*b*) *Appareillage externe.*—Pour éviter les inconvenients de la radiumpuncture, nous avons eu l'idée, sans avoir eu connaissance du travail de A. L. Dean (4), d'utiliser un appareil externe moulé sur les régions de la verge à traiter, et porteur de tubes de radium. Nos appareils ont été réalisés de la façon suivante: enveloppement de la verge cancéreuse par un manchon de pâte Columbia d'un centimètre d'épaisseur avec plaque de plomb à la racine de la verge, pour éviter les accidents de radiodermite de cette région; application sur le manchon, à égale distance les uns des autres, d'une moyenne de dix tubes contenant 5 milligrammes de radium élément filtré par un milimètre de platine; la durée moyenne de l'application a été de 14 jours soit, 126 m.c.d.

Bien entendu des modifications seront apportées à cette disposition des tubes suivant la forme et le volume de la tumeur; c'est ainsi que si celle-ci ne siégeait que sur une partie de la circonférence de la verge, seule la région cancéreuse serait irradiée.

D'autre part, la quantité de radium à appliquer et la longueur du temps d'irridiation seront à déterminer suivant les dimensions de la tumeur et son index karyokinétique.

Par cet appareillage, nous pensons avoir obtenu le résultat qui consiste à irradier, à doses suffisantes, les cellules cancéreuses tout en respectant le stroma conjonctivo-vasculaire, en un mot à atteindre, comme le dit Roussy, le seuil de la radiumsensibilité du stroma conjonctif.

De plus, cet appareillage permet l'application des doses faibles, bien filtrées et durant un temps suffisamment prolongé, suivant la méthode préconisée par De Nabias, cette méthode étant basée sur le fait que les cellules néoplasiques jeunes sont moins résistantes que les cellules néoplasiques âgées aux radiations et nécessistent par suite des doses moindre de radium pour être détruites; d'ailleurs

Mais avant d'étudier celle-ci qui doit être appliquée ainsi que nous le rappelo quelque soit le mode de traitement de la néoplasie (radium ou chirurgie), il no faut examiner le point suivant avant tout acte chirurgical doit-on irradier tumeur pour essayer de stériliser ou tout au moins d'inhiber les cellules cancéreuse qu'elle contient ?

La discussion est là d'ordre général et pour les divers cancers l'accord est loin d'être fait pour le cancer de l'utérus opérable certains auteurs préconisent la radiumthérapie préalable d'autres la déclarent inutile les mêmes divergences se rencontrent à propos des cancers du sein

A notre avis il n'est pas possible de comparer le cancer de la verge qui est un cancer cutané avec le cancer du col de l'utérus Le cancer du sein malgré l'origine ectodermique de cette glande, ne lui est pas non plus comparable Si donc une analogie devait être établie elle ne pourrait l'être qu'avec les cancers de la peau or dans ceux-ci jusqu'à présent du moins il a paru inutile de faire précéder l'acte opératoire de l'irradiation C'est cette ligne de conduite que nous avons suivie jusqu'à présent

2° Traitement prophylactique des territoires lymphatiques

Nous avons dit plus haut ce que nous pensions de l'ablation chirurgicale des ganglions lymphatiques nous n'y reviendrons pas Il nous reste maintenant à voir comment doit être réalisée l'irradiation des territoires lymphatiques qui, dans tous les cas du cancer de la verge tant soit peu développés doivent être considérés comme atteints

Nous réalisons cette irradiation à l'aide d'un appareillage à tension constante de Gaiffe et en utilisant 4 portes d'entrée 2 antéro latérales et 2 postéro latérales La distance de l'ampoule de la peau est de 10 à 15 centimètres La filtration se fait avec 1 mm de cuivre et 2 mm d'aluminium

La quantité des rayons X est de 1 000R environ par champ La quantité totale de 16 000R est répartie sur un espace de temps de 8 à 15 jours Au cours de cette irradiation il est nécessaire de vérifier soigneusement que les champs se rejoignent en avant sur la ligne médiane pour ne pas laisser le plexus lymphatique présymphysien privé de l'action des rayons X et cependant sans se chevaucher pour éviter une radiodermite

De plus il est très important de mettre le malade en position de Trendelenburg de façon à éviter l'irradiation des intestins

La quantité trop minime de radium dont nous disposons ne nous a pas permis d'expérimenter la curiethérapie des zones ganglionnaires

A quel moment doit on pratiquer l'irradiation des territoires lymphatiques ? En raisonnant par analogie avec les cancers d'origine cutanée on pourrait espérer trouver une solution or malheureusement là encore les avis sont partagés, pour les uns (Regaud S Laborde) l'irradiation des régions ganglionnaires doit précéder le traitement de la lésion initiale, pour d'autres auteurs cette irradiation

Cette application continue basée sur ce principe, peut théoriquement être obtenue avec la radiumpuncture ; mais pratiquement il n'en est pas de même, étant donné non seulement la difficulté de faire supporter à un malade, souvent indocile, le port prolongé de nombreuses aiguilles qui, malgré toutes les précautions prises lors de leur fixation au sein de la tumeur, arrivent trop souvent à se mobiliser puis à tomber et même à sectionner les tissus.

Enfin les relativement faibles doses de radium employées, mais dont l'action sur la tumeur est plus rigoureusement répartie, permettent d'éviter la destruction du tissu conjonctif dont les réactions sont indispensables pour le processus de guérison, car grâce à cette réaction se trouve assuré la destruction des cellules cancéreuses qui auraient pu échapper à la mort par les rayons γ et qui après une phase d'inhibition plus ou moins prolongé, seraient devenues susceptibles de pulluler (S. Laborde).

D'ailleurs comme le fait remarquer le Dr. Bablet les constatations microscopiques sont tout à fait en faveur de l'utilisation de l'appareillage externe.

Il est bien entendu qu'avec la radiumpuncture comme avec l'appareillage externe, l'irradiation des territoires lymphatiques corresponds doit être de règle. Nous aurons l'occasion d'en parler un peu plus loin.

D. Traitement mixte.

Le traitement mixte utilise à la fois la chirurgie et les radiations. L'ablation de la tumeur est faite chirurgicalement, les territoires lymphatiques sont irradiés.

C'est d'ailleurs une tendance générale actuelle en matière de traitement des tumeurs cancéreuses, de recourir, sauf les cas très limités, à l'action chirurgicale pour l'ablation de la tumeur. Certes on obtient des guérisons complètes par les radiations seules, la preuve est faite depuis longtemps déjà, mais ne vaut-il pas mieux, dans l'intêret du malade, gagner du temps, et lui éviter la résorption des produits de désintégration de la tumeur ?

C'est ce qui nous a conduit à pratiquer un curettage suivi de cauterisation au thermocautère des bourgeons cancéreux trop volumineux avant l'application de la radiumpuncture ou de l'appareillage externe radifère.

Actuellement, nous avons recours de plus en plus au traitement chirurgical, à moins qu'il ne s'agisse de petites tumeurs, permettant, après cicatrisation de la lésion par le radium, de récupérer une verge d'aspect à peu près normal.

L'extirpation chirurgicale de la tumeur, accompagnée s'il y a lieu de l'ablation des ganglions paraissant atteints, permet d'obtenir en quelques jours une cicatrisation opératoire et de rendre rapidement le malade à ses occupations, ce qui n'est pas le cas, dans le traitement par les radiations seules où la cicatrisation des lésions est toujours lente à se produire.

Le traitement chirurgical est accompagné de l'irradiation des territoires lymphatiques.

IV COMPLICATIONS DU TRAITEMENT PAR LES RADIATIONS

Il est bien entendu que dans les irradiations de la tumeur et des territoires lymphatiques les règles générales à toutes les irradiations en vue d'éviter les accidents généraux seront observées (examen du sang etc.). Nous devons dire que dans les cancers de la verge que nous avons traités nous n'avons jamais observé de complications générales (mal des irradiations) ce cancer dont la surface suinte largement paraît peu prédisposer aux troubles dus à une résorption massive. Seules les altérations sanguines en rapport avec des irradiations larges pourraient peut être amener une anémie intense pour notre part nous n'en avons jamais observé qui nous aient obligés à interrompre le traitement.

Par contre il existe quelques complications locales qui présentent une certaine importance et qu'il faut bien connaître pour tâcher de les éviter dans la mesure du possible.

Laissant de côté les radiodermites qui peuvent la plupart du temps être attribuées à des doses excessives de radiations nous voulons surtout insister sur l'induration des tissus qui se produit dans certains cas et qui peut aboutir à une véritable lignification des tissus nécessitant une amputation secondaire du moignon de verge restant. Comme nous l'avons dit dans un travail antérieur l'induration des tissus que nous avons observée est due à l'emploi de doses excessives de rayons par rapport à la masse du néoplasme à détruire depuis que nous avons utilisé des doses moindres que celles que nous employons au début nous n'avons plus observé de cas de ce genre. Ferrari et Vallet pensent qu'il faut faire intervenir la radiosensibilité particulière du sujet pour expliquer ces accidents. Il est possible que cette radiosensibilité joue un rôle mais à notre avis le rôle prépondérant revient à l'emploi de doses excessives dans la production de cette sclérose intense.

Un œdème du méat avec gêne de la miction pouvant aller parfois jusqu'à l'impossibilité d'uriner peut se manifester dans les premiers jours qui suivent l'application du radium, on se trouve alors dans l'obligation de son[d]er le malade pendant quelques jours, l'introduction de la sonde est parfois difficile et l'usage de sondes très fines peut être indispensable.

Le rétrécissement consécutif du méat est assez fréquent, cette fréquence est plus constante dans les cas où il y a eu destruction du gland, dans ces cas également le rétrécissement est plus précoce. Suivant son degré on aura recours à des dilatations ou à une incision du méat à sa partie inférieure, avec mise en place d'un point de catgut à l'angle de la plaie. Des séances de dilatation progressive seront ensuite pratiquées.

V CHOIX D'UN TRAITEMENT

Il nous semble possible d'envisager le traitement des cancers de la verge, à l'heure actuelle de la manière suivante. 1° S'il s'agit d'un cas de cancer tout au début, à point de départ soit préputial, soit au niveau du gland, sans

ne doit être entreprise qu'après le traitement de la tumeur (Proust et Maurer, Ecole Belge, etc.).

Lorsqu'il s'agit d'un simple appareillage externe, étant donné qu'il semble bien que dans certains cas de cancer d'origine cutané, le traitement de la lésion initiale par la curiothérapie entraîne l'accroissement des métastases ganglionnaires, il parait logique de commencer par l'irradiation ganglionnaire.

Mais devra-t-il en être de même dans le cas ou la tumeur initiale a été soumise à des grattages et à des cautérisations, préalablement à l'application de l'appareillage externe ou dans les cas de radiumpuncture ?

Nous pensons qu'il ne faut pas s'exagérer outre mesure les dangers d'inoculation néoplasique à la suite du curettage et de la thermocautérisation ; ces manœuvres étaient autrefois d'emploi courant dans les cancers du col utérin. et sont encore utilisées par nombre de chirurgiens, et cela sans inconvénient. Mais théoriquement ces inoculations sont possibles, et nous estimons que dans ces cas le plus logique serait de faire les deux irradiations simultanément à l'aide du radium. Mais la difficulté réside dans la nécessité d'une quantité considérable de radium pour réaliser l'irradiation des régions ganglionnaires. Force est donc d'associer le radium et les rayons X.

L'idéal serait de faire une irradiation préalable des ganglions avant la radiumpuncture ou l'appareillage externe et de faire ensuite une deuxième irradiation pour arriver au total de 4.000R au niveau des champs d'irradiation des territoires lymphatiques. Mais une objection se présente aussitôt. L'irradiation incomplète des ganglions ne va-t-elle pas les sensibiliser aux inoculations qui pourraient se produire ; de plus le laps de temps qui va séparer les deux irradiations (temps d'application du radium) ne va-t-elle pas permettre aux radiations de la deuxième série de rencontrer des cellules cancéreuses métastatiques devenues radiorésistantes ?

Pour ces raisons nous pensons, jusqu'à plus ample informé, qu'il vaut mieux faire l'application du radium d'abord et les irradiations ensuite.

En cas d'appareilage externe, il serait possible d'enlever temporairement chaque jours ($1\frac{1}{2}$ à 2 heures) le manchon porteur de tubes de radium et de faire à ce moment les irradiations des territoires lymphatiques. La seule objection que l'on puisse faire est que l'action des rayons γ ne sera plus alors continue. Ce n'est peut-être pas une grosse objection ; l'essai mérite d'être fait.

En ce qui concerne les cas traités chirurgicalement avec ou sans extirpation ganglionnaire, rien ne s'oppose à ce que les irradiations soient commencées avant l'acte chirurgical et continuées immédiatement après, le lendemain même, à la condition de ne pas avoir employé de sutures métalliques.

Mais nous sommes d'avis de soumettre le restant de la verge, ou en cas d'ablation totale, la ligne de suture, à l'action des radiations, par le radium de préférence ou par les rayons X. Dans ce dernier cas, il peut être nécessaire de faire un cinquième champ d'irradiation.

Planche XXIX.

Traitement par Appareil Externe



Fig. 1. Avant.



Fig. 2. Après.



Fig. 1. Avant.



Fig. 2. Après.

retentissement ganglionnaire décélable, on pratiquera d'abord une irradiation des territoires lymphatiques par quatre foyers, puis la tumeur sera traitée par appareillage externe.

Si la tumeur a nécessité un curettage avec thermocautérisation, nous préférons faire l'irradiation après l'enlévement de l'appareillage externe.

2° Si la radiumpuncture est indiquée, l'irradiation des territoires lymphatiques sera faite après l'ablation des aiguilles.

3° Quand la verge est plus atteinte et que l'on ne peut espérer obtenir par les radiations une cicatrisation avec une verge d'aspect à peu près normal, l'ablation chirurgicale de la tumeur soit au bistouri, soit au couteau diathermique, comme l'a fait Le Fur est indiquée. Les ganglions hypertrophiés seront enlevés chirurgicalement. L'irradiation des zônes ganglionnaires sera faite aussitôt que possible après l'intervention (le lendemain même). Le moignon de la verge restant étant soumis également aux irradiations (soit radium, soit rayons X).

4° Dans les cancers de la verge très étendus en surface et en profondeur, l'ablation large de tous les tissus suspects et des ganglions hypertrophiés sera faite au bistouri ; et aussitôt que possible les irradiations seront commencées, et l'on omettra pas de traiter la ligne de suture, pour le cas où l'exérèse n'aurait pas dépassé la limite des tissus atteints ou pour éviter le developpement les cellules cancéreuses qui auraient pu être inoculées au cours de l'intervention.

* * * * * *

Nous reproduisons ci-après quelques photographies des malades traités par nous.

INDEX BIBLIOGRAPHIQUE.

(1) F. Ferrari et Ch. Viallet (1927) .. Archives d'Electricité Médicale, No. 527. p. 257.
(2) Degorce (1913) .. .. IIIè Congrès de la Far Eastern Association of Tropical Medecine, Saigon.
(3) Le Roy Des Barres et Heymann (1927). Le cancer de la verge au Tonkin. *Journal radiologie et d'Electrologie.* T. XI, No. 2.
(4) A. L. Dean (1926) .. .. *Amer. Jour. Rœntgenology and Radiumtherapy.*

PLANCHE XXX

Traitement par Appareil Externe.



Fig. 1. Avant.



Fig. 2. Après.



Fig. 1. Avant.



Fig. 2. Après.

PLANCHE XXXI

Traitement par Appareil Externe.



Fig. 1 Avant



Fig. 2 Après



Fig. 1 Avant



Fig. 2

OPHTHALMOLOGY.

GLAUCOMA AS SEEN AT THE CALCUTTA EYE INFIRMARY
1st November 1926 to 31st October 1927.

BY

Lieut Col W V COPPINGER I M S
Professor of Ophthalmology, Medical College, Calcutta

This paper is an analysis of the glaucoma cases dealt with in the hospital iring practically the first year in which it has been opened, under a new system investigation and record taking which gradually got into shape during the ar The total number dealt with was 205 which may be grouped under the ugh clinical classification, of (1) *simple* due apparently to abnormalities of the eye ther congenital or due to age only (2) *epidemic dropsy* with a concurrent history this disease or at least very clear exposure to it, but not showing inflammatory ianges (iritis, etc), (3) inflammatory in which there is definite evidence of con irrent or precedent inflammatory disease of the eyes, iridocyclitis etc , and (4) taract glaucoma TUESDAY, DEC. 6TH, 10 A.M. TO 1 P.M.

TABLE I

Statistical figures of glaucoma cases Medical College Hospital, Calcutta November 1926 27

A

Type of Glaucoma	Mean Ages		Mean Blood Pressure		Wassermann reaction positive	Average
Simple	(73)	50 8	(37)	103—137 3	(33) 31 per cent	
Epidemic Dropsy	(62)	40·8	(55)	100 3—133 1	(–3) 20·7 "	–3 5
Cataract .	(23)	56 8	(15)	103 4—136 2	(14) 7 1	
Inflammatory .	(37)	42 1	(–0)	104—122	(–5) 75 6	

Figures in brackets indicate the number of cases from which the mean figures were taken

OPHTHALMOLOGY.

GLAUCOMA AS SEEN AT THE CALCUTTA EYE INFIRMARY 1st November, 1926 to 31st October, 1927.

BY

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THIS paper is an analysis of the glaucoma cases dealt with in the hospital T[illegible] during practically the first year in which it has been opened, under a new system [illegible] of investigation and record-taking, which gradually got into shape during the [illegible] year. The total number dealt with was 205, which may be grouped under the [illegible] rough clinical classification, of (1) *simple* due apparently to abnormalities of the eye either congenital or due to age only; (2) *epidemic dropsy* with a concurrent history of this disease or at least very clear exposure to it, but not showing inflammatory changes (iritis, etc.); (3) inflammatory in which there is definite evidence of concurrent or precedent inflammatory disease of the eyes, iridocyclitis, etc., and (4) cataract glaucoma.

TABLE I.

Statistical figures of glaucoma cases, Medical College Hospital, Calcutta, November 1926-27.

A.

Type of Glaucoma.	Mean Ages.		Mean Blood Pressure.		Wassermann reaction positive.	Average.
Simple ..	(73)	50.8	(37)	103—137.5	(33) 9.1 per cent	29.8
Epidemic Dropsy	(62)	40.8	(35)	100.3—135.1	(29) 20.7 "	
Cataract ..	(29)	56.8	(15)	109.1—136.2	(14) 7.1 "	
Inflammatory ..	(37)	42.1	(20)	95.1—122	(25) 75.6	

Figures in brackets indicate the number of cases from which the mean figures were taken.

Treatment

Early operation was the rule except in definitely inflammatory cases Trephining was done in the great majority, 116 out of [illegible]08 but the percentage is really higher as in many cases both eyes were trephined in one sitting The following table shows the operation done —

TABLE II

Glaucoma operations, Medical College Hospital Calcutta [illegible] 1926 27

Trephining	146 patients	[illegible]
Simple iridodialysis	21 patients	[illegible]
Iridodialysis and removal of lens	23 patients	Cataract [illegible] cases
Posterior sclerotomy with iridodialysis and removal of lens	9 patients	

In 5 cases *enucleation* was done and in 6 cases [illegible]

In 2 cases deep alcohol injections were given [illegible]

The results on the whole were very satisfactory, no case of late post operative infection through the trephine hole has been seen this year in the clinic though a few cases have been observed in previous years One eye was lost from late hæmorrhage 2 to 3 days after operation in a cataract glaucoma case after removal of the lens and post sclerotomy (B P 180/122 W R —) and two solt blind eyes occurred in two late epidemic dropsy cases in which the original trephining failed to lower tension and multiple operations were done In one the Wassermann reaction was minus and in the other, doubtful

Operative treatment was greatly aided by superficial, and occasionally deep, intra orbital anæsthesia by novocain adrenalin injections and in no case was there trouble in trephining owing to high tension As regards non operative treatment, leeching, purging and *morphia* were regularly used to lower tension, especially before operation, and, after operation massage and the use of anti [illegible] remedies in cases showing a positive Wassermann reaction [illegible] injections of novocain adrenalin appeared to lower tension before operation, especially in cataract glaucomas, probably by the [illegible] ischæmia, but injections of adrenalin alone had no definite effect in lowering tension

For cyclitis cases, intravenous injections of 20 c cs of 10 per cent [illegible] solution and deep intramuscular injections of [illegible]

B.

Type of Glaucoma.	Sex.	
	Male.	Female.
Simple	57	16
Epidemic Dropsy ..	44	18
Cataract ..	21	13
Inflammatory ..	16	13

Other cases of glaucoma due to unusual causes not included in this series.
One case of hæmorrhagic retinitis with albuminuria, M. M., *æt.* 40.
One case of recent non-perforating injury of eye.
One case of extreme anæmia, W. R., I. C. F., *æt.* 19.
One case of following couching.

Analysing the above table, it will be seen that there is a large excess of male patients except in inflammatory cases. The mean ages show that much the youngest group is the epidemic dropsy, as might be expected, as the disease is found in young children though the youngest case in my series was 16 years of age. Inflammatory is next, and after that simple and cataract. It was in some cases very difficult to differentiate between the most probable causes with a view to classification, but on careful consideration of the case sheets the numbers are as given.

The blood pressure figures are interesting. In all of them except the inflammatory group perhaps, the diastolic pressures are distinctly high. This is most marked in the epidemic dropsy cases, suggesting some alteration in pressure regulation of the main cardiovascular system associated with glaucoma, as well as the ordinary local changes in the eye associated with Priestly Smith's theory of glaucoma. It is a point which cannot be pressed on this small number of cases but which is worth looking into, especially as abnormalities in the urine are rare in this series. Only 4 cases showed albuminuria, 2 cases sugar, and 1, both sugar and albumen. The results of Wassermann examination are also interesting. The total percentage of 29·8 of positive results of all cases examined is very high, and has made me arrange for the examination of the serum in all glaucoma cases. Inflammatory cases naturally show a high percentage, but the epidemic dropsy cases at 20·7 per cent are also high.

Of the unusual cases, one case of hæmorrhagic retinitis is not remarkable, but the other, in a very anæmic young woman with no history of epidemic dropsy and a negative Wassermann reaction is suggestive, if one considers the problem of blood changes as causing this disease. Of course the high incidence figure for epidemic dropsy is not normal in Calcutta, but was associated with the prevalence of the disease in 1926 and its continuance and later results in 1927.

TREATMENT

Early operation was the rule except in definitely inflammatory cases Trephining was done in the great majority 146 out of 208 but the percentage is really higher as in many cases both eyes were trephined in one sitting The following table shows the operation done —

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Trephining	146 patients	[illegible]
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For cyclitis cases, intravenous injections of 50 c cs of 10 per cent saline solution and deep intramuscular injections of their own venous blood and milk

B.

Type of Glaucoma.	Sex.	
	Male.	Female.
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Epidemic Dropsy ..	44	18
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Other cases of glaucoma due to unusual causes not included in this series.
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iridectomy or trephining, is well covered by conjunctiva, this complication is not as important as might be expected, as the relief of pain, which is usually all that can be expected in this class of case, is accomplished

In the presence of active epidemic dropsy, the best decompression operations seem to fail, even when repeated, and rise of tension recurs The worst cases of glaucoma I have seen in 1926 27 were in patients who had previously suffered from epidemic dropsy in the 1917 epidemic and again this year In such active cases my rule has been to get the patient away from his house and the endemic area as soon as possible after operation as this seems to be the best way of coping with the disease, and all cases so treated have done very well, whereas in some of those cases in whom this change was not possible, the recurrence of the condition of high and irregular tension has led to serious further loss of vision

I must apologise for the want of completion of my records due to the newness of our system and record taking, but hope for better things in the coming years *Those made already are at least suggestive and give an idea of the incidence of glaucoma as seen here*

injections seemed to have no effect. Anti-syphilitic remedies were really useful even when the Wassermann reaction was negative.

In certain of these cases, in spite of large clear openings 1·5 to 2 mm. in diameter and clear drainage, the intra-ocular tension either does not come down or, having come down, rises again very soon. This especially occurs in epidemic dropsy and some of the inflammatory cases, suggesting that the cause of the rise in tension is due not merely to an obstruction at the drainage channels from the eye, but to some alteration in the intra-ocular fluids, and in the capacity of the vitreous to hold them as a gel, as suggested by Duke Elder in his recent writings. I have had no opportunity of examining the pH value of the intra-ocular fluids which appears from Duke Elder's work to govern the amount of fluids absorbed and the tension, in the case of vitreous, but I would suggest that the markedly high diastolic blood pressure shown in this series of glaucoma cases suggests some alteration in the blood plasma and its reactions on the smaller blood vessels. Of course the rise in tension in inflammatory cases after a decompression operation may be explained by the closing up of the new drainage channels by inflammatory exudates but in some of these cases, at least, this appears to act too quickly to allow of this explanation being tenable.

I would also point out that bandaging of both eyes and their immobilization after a glaucoma operation in one eye, frequently causes a temporary rise of tension in an apparently normal other eye, this fact confirming, in some degree, the theory that the intra-ocular circulation is largely maintained by the movements of the eyes and lids and also showing that a state of loss of tension equilibrium in both eyes exists in these cases.

Of the cause of failure in technically satisfactory decompression operations, I think the most important late cause is that of inflammatory exudate due to syphilis. In a number of these cases, the tension rose after decompression and fell under anti-syphilitic treatment, even in cases in which there was no previous manifestation of inflammatory disease. My rule now is to take the blood for Wassermann examination in all cases at the earliest possible moment and operate as soon as circumstances indicate, usually at once. The report on the Wassermann is received in 3 to 4 days and, if positive, treatment is started at once. Since this has been done my late results have materially improved. Another point noticed, is that in some cases since operating with strong focal light and irrigating with saline to remove blood, the portion cut by the trephine appears to consist of two pieces, the normal scleral tissue and a separate thin transparent flap formed by the deeper Descemet's membrane, where it passes over the back of the sclerocornea to join with the pillars of the pectinate ligament. This, owing to its transparency, may be left behind after the normal scleral flap is removed and cause blocking of the drainage.

In a few old-standing cases of glaucoma, the vitreous is completely liquefied and on any operation wound being made in the eye, it appears through the aperture even though well placed. If, however, as is usual in my cases, the wound,

Table.

Statistical Analysis of 253 Cases according to Race, Sex, Age, Locality and Occupation

Race	Number of cases	Sex	Number of cases	Age	Number of cases	Locality	Number of cases	Occupation
Hindus	230	Males	188	Below 10	1 (8 years old)	Town of Calcutta including Howrah	183	All of more or less sedentary life—clerks, students and women formed the major part
Mohammedans	23	Females	65	Between 10–19	32	Suburbs of Calcutta	47	
				Between 20–39	131			
Christians	Nil			Between 40–60	82	Outside	23	
				Above 60	7			

From the table it is obvious that the disease is prevalent among the Hindus (90 per cent) whose staple food is rice. It is more common between the ages of 20 and 40 and rare in the early and old ages. It is rather common among the mediocre class and rare among the labouring people.

Onset

1. *Prodromata.*—In almost every case the disease began with transient obscuration of vision and seeing of rainbow haloes. These haloes were sometimes seen in the morning, more often in the day, sometimes in the afternoon and at night round the source of light, but every time they were transient. Sight would become foggy and misty after near work. Occasionally there was shooting pain in the forehead. *Some cases did not pass beyond this stage.*

2. *Progressive stage.* (*a*) Subjective phenomena.

(*i*) Pain—varied enormously in different cases. Generally speaking it occurred as a result of congestion, because all these cases of increased tension are the result of subacute congestion. In some cases there was complaint of sensation of heaviness, discomfort or pressure on the globe and these sensations came on periodically; in other cases the pain was of a neuralgic character shooting not only to the head but to the neck, ears and teeth.

(*ii*) Lacrimation came on as a reflex phenomenon due to irritation by increased tension.

(*iii*) Nausea and vomiting were very rarely seen except in 3, one male and two females. In all the cases these symptoms came on concomitantly with the rise of the tension.

GLAUCOMA AS A RESULT OF EPIDEMIC DROPSY.

BY

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ALTHOUGH throughout my practice cases of glaucoma were seen from time to time with a previous history of epidemic dropsy or beri-beri, yet it is the overwhelming number of cases occurring as a special feature of the last year's epidemic which prompted me to make a thorough investigation of this ocular manifestation. It is no part of my task to discuss the relationship between epidemic dropsy and beri-beri, but my main interest is to find out the relationship of the increased intra-ocular tension with the so-called disease epidemic dropsy or beri-beri. My observations are based on 253 cases including 206 at the hospital and 47 private cases.

HISTORY.

The first outbreak of epidemic dropsy which attracted the notice of medical men occurred about the years 1907-08. There had been two other outbreaks following and the fourth one, from which most of my observations have been derived, began about the month of August in the year 1926. The duration of the past outbreaks have been more or less limited, but the one under discussion has been rather lingering and it is to be noted with alarm that sporadic cases are still going on at places.

Looking back to the literature, I do not find much description of to-day's topic except the observation of Lieut.-Col. F. P. Maynard, I.M.S., the then ophthalmic surgeon, Calcutta Medical College, of only 20 cases during the first outbreak and a few other scattered observations.

In most cases, the disease came on during the convalescent state of epidemic dropsy or during the course of cases of milder but prolonged attacks. Another point of note is that most of the patients were constipated and those who had got looseness of bowels generally escaped from this ocular complication. In some cases, the disease was found in more than one member of the same family. In others again, the increased intra-ocular tension was the only manifestation of the disease as deduced from cases of general disease occurring in the family. The usual rule that small eyes and hypermetropes are specially liable to glaucoma did not hold good in these cases. Some cases were noticed in myopes also.

TABLE

Statistical Analysis of 253 Cases according to Race, Sex, Age, Locality and Occupation

Race	Number of cases	Sex	Number of cases	Age	Number of cases	Locality	Number of cases	Occupation
Hindus	230	Males	188	Below 10	1 (8 years old)	Town of Calcutta including Howrah Suburbs of Calcutta	183	All of more or less sedentary life—clerks, students and women formed the major part
Mohammedans	23	Females	65	Between 10–19	32		47	
				Between 20–39	131			
Christians	Nil			Between 40–60	82	Outside	23	
				Above 60	7			

From the table it is obvious that the disease is prevalent among the Hindus (90 per cent) whose staple food is rice. It is more common between the ages of 20 and 40 and rare in the early and old ages. It is rather common among the mediocre class and rare among the labouring people.

ONSET

1 *Prodromata*.—In almost every case the disease began with transient *obscuration of vision and seeing of rainbow haloes*. These haloes were sometimes seen in the morning, more often in the day, sometimes in the afternoon and at night round the source of light, but every time they were transient. Sight would become foggy and misty after near work. Occasionally there was shooting pain in the forehead. Some cases did not pass beyond this stage.

2 *Progressive stage*. (a) Subjective phenomena.

(i) Pain—varied enormously in different cases. Generally speaking it occurred as a result of congestion, because all these cases of increased tension are the result of subacute congestion. In some cases there was complaint of sensation of heaviness, discomfort or pressure on the globe and these sensations came on periodically; in other cases the pain was of a neuralgic character shooting not only to the head but to the neck, ears and teeth.

(ii) Lacrimation came on as a reflex phenomenon due to irritation by increased tension.

(iii) Nausea and vomiting—were very rarely seen except in 3, one male and two females. In all the cases these symptoms came on concomitantly with the rise of the tension.

GLAUCOMA AS A RESULT OF EPIDEMIC DROPSY.

BY

S. K. MUKERJEE, F.R.C.S. (Edin.), D.O. (Oxon.), D.O.M.S. (Lond.),
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(*vii*) Fundus—in the congestive cases, on account of the misty cornea, a proper view of the fundus could not be obtained and as no mydriatic could safely be given it was not possible to see the fundus clearly When the congestive symptoms were less ophthalmoscopic examination revealed cupping of the optic disc even in an early case The cupping is not like that in ordinary glaucoma but is little more than a deep physiological cupping confined to the disc itself but it is of a progressive type Hyperæmia of the nerve head was the rule in the early stages The alteration in the apparent direction of the retinal vessels as they pass out from the disc was present sometimes as a slight bend or kink In about 3 of my cases pulsation of the arteries was seen at these bends and the pulsation became very prominent by increasing the pressure over the globe by means of the finger

(*viii*) Retina in only 3 cases retinitis was found and in all these 3 cases traces of albumen were found in the urine Whether this retinitis is an accidental coincidence or not it is very difficult to say But in some the retinal vessels were tortuous and the arteries thread like, probably due to compression In one or two cases retinal hæmorrhage with dilated veins was noticed

Field of Vision

In all my hospital cases perimetry by McHardy's perimeter and scotometry were done at the commencement and from time to time while the patients were kept under observation under miotics Special stress and care was given to this examination for the two signs on which my operations were based were changes in the field of vision and persistence of high tension even under the lavish use of miotics Even this practice did not give me as good an opportunity to study the gradual changes in the field as one might think for most of the cases in spite of advice did not turn up until their central vision was interfered with by which time there was probably a great development of concentric contraction and tube vision Enlargement of the blind spot (Seidel's sign) was found in many cases, and Bjerrum's sign was also found but the almost constant change found was contraction of the nasal field Concentric contraction producing tube vision was found in late cases some of them retaining quite normal central vision

Tension

This was measured in every case with McLean's tonometer On an average the tension varied from 70 to 100 mm of Hg and was found in some cases to vary very much during the course of a day even coming down to normal

Ætiology

In order to ascertain the ætiology and the real pathology of the disease the urine and blood were examined in the Carmichael Medical College laboratories as regards their different contents and records of blood pressure were noted from time to time The urine showed nothing particular except in complicated cases

(*iv*) Haloes—have been already described. In some radiating rays round source of light were seen dazzling the vision.

(*v*) Vision—misty vision and diminution of visual acuity were concomitant factor, if not an usual sign of increased intra-ocular tension, as in many cases the central acuity was preserved for a long time. In most of the advanced cases, however, side vision diminished or else the patient complained of looking as if through tubes.

(*b*) Objective.

(*i*) Conjunctiva and sclera—in almost all cases these were not much affected except for an enlargement of the anterior ciliary veins which were more marked at their entrance, standing out as red spots against a white scleral background. In a very few cases a little redness of the conjunctiva simulating chronic conjunctivitis was observed.

(*ii*) Cornea—in almost all cases change in the lustre of the cornea was a prominent symptom. In some it became steamy, in others it had a ground glass appearance. This change in the cornea accounts for the increase of misty vision which has been described in various ways by many people, viz., seeing through smoke or fog in the atmosphere. The haloes complained of are entirely due to the refractive changes in the œdematous cornea. These were a constant symptom in every case thus differentiating the disease from ordinary chronic glaucoma where the seeing of haloes is not a constant symptom.

(*iii*) Anterior chamber—this was either normal or even deep as against the rather shallow anterior chamber of chronic or acute glaucoma, shallowness being observed in half a dozen cases only.

(*iv*) Iris—the pupil was rarely dilated as in ordinary forms of glaucoma, it being normal or only moderately dilated in almost all cases with the reaction either normal or sluggish. In ordinary types, change in the pupil is a constant feature, whereas in this type it is not so. In ordinary types, as the disease passes from the progressive to the established stage, the dilatation of the pupil and sluggishness of the iris becomes more marked until, at a late stage, the iris gets discoloured, degenerated and atrophied. Such a change in this type of glaucoma was never seen and, if ever the pupil was dilated, it was so uniformly and never irregularly like the ordinary types.

(*v*) Ciliary body—the earliest sign showing involvement of the ciliary body was associated with weakness of accommodation which might linger as the only symptom. In some, therefore, there was development of early presbyopia, but in others the use of glasses was not required sometime after.

(*vi*) Lens—I have never seen any change in the lens concomitant with the high tension, but in two or three cases opacity developed after operation even where no instrument was introduced into the anterior chamber. The media appeared to be almost clear as far as examination through the hazy cornea was possible.

(c) Dietetic—Milk and protein diet were insisted on and as much fresh fruit possible was advised Most were advised to take bread instead of rice at least the night meal

Local—(a) Medicinal—Pilocarpine and sodium iodate lotions were used in ld cases and the majority who came early in the disease were cured some re iring free instillation of pilocarpine and eserine, others adrenalin drops in dition

(b) Operative—In those cases where the tension persisted in remaining gh even under the free instillation of miotics or when the field of vision gradu y decreased, operation was undertaken Trephining was done in 57 cases and iple iridectomy in 2 cases The results were all satisfactory except in 5 or 6 ses where complications came on during after treatment On looking through records, nothing impresses me so much as the fact that cases on which I was le to operate early gave by far the best results So far as I have been able follow my cases, my failures, of which I had 4 or 5 cases have been in those ere tension was very high at the time of operation where the history was of g standing and where the field had been generally contracted almost to the ation point In 2 cases only were my failures due to some complication during st operative treatment—severe iritis in one and intra ocular hæmorrhage the other In some cases so far as the vision was concerned the patients felt ittle worse just immediately afterwards but all showed improvement later on, necessary, by the addition of glasses

As regards complications during operation button holing of the conjunctival p occurred in a few cases A small button holing did not appear to constitute y dangerous complication and, touched with tincture of iodine it healed up idily In one case there was a big button holing and I had to select a separate e for trephining In 2 cases the scleral disc after trephining was lost in the terior chamber but it caused no harm at any time the tissue being isotonic the eye In many cases there was superficial hæmorrhage obscuring vision for ew days after operation due to a bleeding diathesis concomitant with the changes the blood vascular system This was stopped by the local application of renalin drops or mopping by the assistant during operation and controlled er by bandaging and atropine drops only In 3 cases there was complete dectomy instead of a button hole one, but by itself, it did not form any mplication In one case there was an iridodialysis of almost three quarters the iris with hyphæmia, but the patient regained a full 6/6 ? ? vision after overy I have been fortunate not to get any other complications during eration

Amongst the complications coming on during after treatment, there was ld iritis in a few cases severe iritis in 2 and in 3 or 4 cases there was delay reformation of the anterior chamber In spite of my using a suitable irrigator the time of the toilet of the eye blood was found in the anterior chamber on e first day of dressing in a few cases and in some it persisted for a few days,

There was a definite and well-marked increase of uric acid in the blood, although there was practically no increase in non-protein nitrogen, creatinin, urea and blood-sugar. The calcium content was found to be definitely decreased. Anæmia, moderate leucopenia and increase of mononuclears were the characteristic blood picture. From the negative results of all these examinations I should say that, while we are still groping in the dark as to the exact cause of epidemic dropsy, it is useless to attempt to find out the definite cause of the increased intra-ocular tension concomitant to the general disease. Still, from the clinical features, I may make an humble attempt to come to a cause. Rise of intra-ocular tension must be due, either to the increased formation of lymph, or to diminished outflow. Both conditions may be present. In the majority of cases I have seen, however, that evidence of diminished outflow is incomplete, the anterior chamber is not shallow and the filtration angle appears open where the ciliary veins are not much enlarged and the pupil not dilated. There are no signs in any case of any infiltration of the uveal tract. Bearing in mind the cardio-vascular changes associated with epidemic dropsy, we can think that this is due probably to the hyper-secretion of the ciliary body on account of the passive congestion and that the variation in increase or decrease of the intra-ocular tension is concomitant with the increase or decrease of the defective eyesight. Whatever be the nature of the causal agent, either the toxic amines produced in badly stored rice, the toxin of adulterated mustard oil, infection by some sort of germ or deficiency of vitamin, from the clinical features it appears that the primary lesion seems to be a damage to the capillaries either directly or through the sympathetic nerve-endings whereby increased transudation of fluid from the vessel wall occurs. From the absence of glaucoma in diarrhœic cases and also from the amelioration of tension in cases treated with saline purges, it appears that so long as the toxins are being eliminated profusely through the intestinal canal they have much less chance to do damage to the eye capillaries.

Treatment.

General.—(*a*) Hygienic—Rest, change of climate to dry places of moderately high altitude, such places in India being, Santhal Parganas, Hazaribagh, etc. Avoidance of overcrowding, fresh air, limitation of rice diet and adulterated mustard oil were also of much benefit.

(*b*) Medicinal—Calcium salts in the form of calcium lactate, Kalzana, collocalcium per os or intravenous injection of calcium chloride in persistent cases were all given. To dehydrate the tissues, saline purgatives in the form of Eno's fruit salt or rubinath water in the morning or mist. alba in the day-time were administered. As a diuretic and diaphoretic, mist. alkalin. diuretic with potas. citras. was given. As an intestinal antiseptic and tonic stimulant, *Makaradhwaja* and strychnine sulphate tablets were prescribed together with mist. ferri et strychnini twice daily after food as a nerve tonic in the convalescent stage.

INTRA OCULAR TENSION

BY

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AND

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THE following experiments were made with the object of investigating the method of lowering the intra ocular tension by the intravenous injection of hypertonic sodium chloride solution, indicated by Duke Elder(1) In India where large numbers of cases of all varieties of glaucoma attend our clinics, any safe method of reducing the intra ocular tension prior to operation must prove of the greatest value In this country our hospital patients are frequently debilitated, *in many cases half starved and a large proportion suffer from vascular degeneration* In many of these cases the intra ocular tension does not yield to routine treatment by leeches, miotics and purgatives, and to operate to restore the tension to its normal balance is dangerous and unsatisfactory If, therefore, the tension can be lowered as stated by Duke Elder even for a short time, operative results are likely to be more satisfactory In addition to the trial of the method as a clinical therapeutic measure, the process has been investigated chemically with a view to determining if the changes in intra ocular tension resulting from the injection of hypertonic sodium chloride solution could be correlated with changes in the blood In the latter object we were singularly unsuccessful, but we think that this negative result is of some interest.

EXPERIMENTAL.

A series of cases of glaucoma patients were taken without selection so far as the variety of glaucoma was concerned Their body weight, blood pressure, intra ocular tension and a sample of blood were taken before saline injection The hypertonic sodium chloride solution (30 grammes in 100 c cs) was given over a period of not less than ten minutes with the patient lying down Fifteen minutes after the injection another sample of the blood was taken, and the blood pressure and intra ocular tension again determined at intervals. With the [illegible]

our freezing point determinations are absolutely correct but we think that the difference between the freezing point before and after injection are reliable to within at least 0 02°C

For the determinations of total solids ash and chlorides whole blood was taken One or two grammes of blood were weighed out evaporated on a water bath and dried to constant weight in an oven and vacuum (sulphuric acid) desiccator About ten hours on the water bath or in the oven and three nights in the desiccator were sufficient The weighings had to be done quickly as the dried blood was very hygroscopic The total solids having been weighed these were then ashed at less than a dull red heat and when carbonized the residue extracted with water in the usual way Great care was necessary over the weighings of the ash as it absorbed water from the air very quickly The ash was then extracted with nitric acid and the chlorides in it determined by Volhard s micro method Controls using the same blood for several determinations indicated that the total solid figures were to be relied on to within 2 milligrams and the ash to within about half a milligram

The results of our experiments are shown in the following table —

TABLE I

Patient Number	Dose in grammes per kilo	Intra ocular tension R	Intra ocular tension L	R B C × 10⁶	Freezing point of the blood	Total solids	Ash (as per cent of blood)	Chlorides (as per cent of blood)	Hydrostat blood pressure
1	0 136	65	14	—	—	—	—	—	115
		40	12	—	—	—	—	—	—
2	0 111	31	—	—	—	—	—	—	—
		18	—	—	—	—	—	—	—
3	0 0[illegible]	65	—	—	—	—	—	—	—
		70	—	—	—	—	—	—	—
4	0 1[illegible]1	70	—	—	—	—	—	—	145
		80	—	—	—	—		—	1[illegible]
5	0 [illegible]88	—	80	—	—	—	—	—	1[illegible]0
		—	68	—	—	—	—	—	—
6	0·1[illegible]	70	—	4 0	−0 6[illegible]	19 7	0 88	0·[illegible]3	1[illegible]
		15	—	3 6	−0 64	1[illegible] 4	0 [illegible]	0·311	1[illegible]
7	0 0[illegible]	30	20	4 6	−0 [illegible]	[illegible]1 0	0 [illegible]	0·31[illegible]	1[illegible]
		20	15	3 8	−0 [illegible]	1[illegible]	0 [illegible]	0·341	1[illegible]

blood, red cell counts (with a view to determining the change in blood volume) determinations of the freezing point, total solids, ash and chlorides were done.

The blood pressures were taken with a Riva Rocci sphygmomanometer as modified by Martin, with the patient lying down.

The intra-ocular tensions were taken with a Bailliart tonometer applied to the cornea.

The hypertonic sodium chloride solution was given through a needle attached to a tube and funnel into a vein in the arm, the rate of flow being regulated by raising and lowering the funnel. A few c.cs. of physiological saline were first given and then the 30 grammes per 100 c.cs. sodium chloride, and again at the end a few more c.cs. of physiological saline, thus avoiding the danger of any of the strong solution getting into the tissues. In drawing the blood after the injection, the opposite arm to that used for the introduction of the salt solution was always used.

The dose given was in most cases 20 c.cs. and with these patients worked out to an average dose of 0·134 gramme of sodium chloride per kilogram of body-weight. Duke Elder states that with European patients 0·3 gramme of sodium chloride per kilo of body-weight given over 10 minutes is within the limit of safety. Owing to differences in race of the patients and of climate, we decided to give a much smaller dose. In the first two cases of our series 20 c.cs. were given, which worked out to 0·136 and 0·111 gramme per kilo body-weight respectively. In each case the patient showed no distress during the injection, but about 15 minutes later suffered from great thirst, shivering, very severe headache, and a rise of temperature. The symptoms were so severe that water was given freely but the headache persisted till evening. None of the other patients has shown any alarming symptoms.

In the chemical examination of the bloods, the determinations of the freezing points gave us a lot of trouble. For this purpose serum was taken. To use an ordinary Beckman's apparatus requires about 20 c.cs. of fluid, and we thought that to take enough blood to supply two lots of 20 c.cs. serum from each patient would be subjecting the patient to an excessive bleeding and complicating the interpretation of the results. A smaller modification of a freezing point apparatus was therefore devised, and a long series of controls and further modifications of the apparatus were found necessary before it could be relied on to give consistent results. This apparatus would work with about 4 c.cs. of serum. We found it essential to have the freezing mixture many degrees lower than the freezing point of the serum in order to get freezing in a reasonable time, and to replace this as soon as freezing had occurred by a thermos jar containing a mixture of ice and dilute salt solution at about half a degree lower than the freezing serum. The jar kept its temperature constant to within a tenth of a degree throughout the experiment. The amount of supercooling was measured and the calculated correction applied. A mechanical stirrer which ran at a constant rate was also found essential. With the apparatus working at its best we do not claim that

In this table where two lines of figures are given against a patient, the upper line shows the figures for the blood before injection of sodium chloride and the lower line after The double column of figures under intra-ocular tensions are the tensions for the right and left eyes The intra ocular tensions were deter mined before, just after one hour after injection, on the evening of the day and next morning It was found that on the average the evening tension was the lowest and the figures given in the table for the tension after injection are the evening tensions The fall, however was nearly complete within 15 minutes of giving the salt solution, the average figures being —

Before	16 7
Just after	31 2
One hour after	31 6
Evening	32 5
Next morning	31 1

It was thought that the evening tension was the best one to take for com parison as being less disturbed by the operative procedures the patient had been subject to The means of the figures before and after injection are shown at the bottom It will be noticed that on the average the ocular tension fell 11 mm, the blood volume as deduced from the red cell counts rose 20 per cent (that is, taking it as 100 before it was 120 after) the freezing point depression rose 0 05°C corresponding to an increase in osmotic pressure of 160 mm. mercury the percentage of total solids fell 1 1 and the percentage of ash and chlorides were not much altered The hydrostatic blood pressure rose on the average 6 mm. of mercury *The following table brings out these differences more clearly* —

TABLE II

Patient Number	Dose	Intra ocular tension before	Changes in: Intra ocular tension	Blood volume	Freezing point	Total solids	Percentage of Ash	Chlorides
4	0 1[illegible]1	70	10	—	—	—	—	—
5	0 088	80	—1[illegible]	—	—	—	—	—
6	0 1[illegible]	70	—[illegible]	111	—0·0[illegible]	—2 3	+0 09	+0·03
7	0·09[illegible]	70	—10	1[illegible]1	—0·02	—[illegible]1	—0·03	—0·0[illegible]1
		0	—[illegible]					
8	0 1[illegible]0	65	—15	111	0	—1[illegible]	0·10	0·0[illegible]
		70	—4[illegible]					
9	0 1[illegible]3	45	—20	131	—0·03	—0·5	0·04	—0·0[illegible]
		55	—[illegible]					

TABLE I—*contd.*

Patient Number	Dose in grammes per kilo.	Intra-ocular tension. R.	Intra-ocular tension. L.	R. B. C. $\times 10^{-6}$	Freezing point of the blood.	Total solids	Ash (as per cent of blood)	Chlorides (as per cent of blood)	Hydro-static blood. pressure.
8	0·130	65	70	5·85	—0·56	19·3	0·97	0·319	95
		50	30	5·25	—0·56	17·6	1·07	0·375	105
9	0·123	45	55	4·55	—0·59	19·5	0·97	0·339	140
		25	50	3·47	—0·62	19·0	1·01	0·331	145
10	0·150	80	70	4·12	—0·56	19·6	1·03	0·332	100
		40	40	3·07	—0·62	19·2	1·09	0·340	120
11	0·129	35	40	5·25	—0·54	18·7	1·00	0·290	110
		22	25	4·10	—0·57	17·6	0·94	0·305	110
12	0·194	60	33	4·90	—0·51	17·3	0·92	0·272	120
		68	35	3·75	—0·57	16·6	1·17	0·311	135
13	0·151	18	20	4·00	—0·49	20·3	0·98	0·335	165
		13	18	3·75	—0·60	18·8	1·12	0·350	160
14	0·134	45	42	4·25	—0·54	19·7	1·07	0·367	125
		18	16	3·55	—0·61	17·7	0·90	0·352	125
15	0·154	60	32	4·0	—0·61	—	—	—	145
		45	18	3·2	—0·65	—	—	—	150
16	0·151	45	20	4·50	—0·59	—	—	—	135
		42	25	4·25	—0·65	—	—	—	140
17	0·123	55	50	5·85	—	—	—	—	150
		30	25	4·75	—	—	—	—	155
18	0·126	30	30	4·80	—	—	—	—	145
		22	18	4·35	—	—	—	—	155
19	0·174	—	—	—	—	—	—	—	135
		—	—	—	—	—	—	—	—
20	0·129	45	50	4·35	—0·61	16·4	0·96	0·393	170
		35	35	3·95	—0·64	15·6	1·00	0·385	185
Means	0·134		47	4·65	—0·56	19·2	0·98	0·324	133
			34	3·92	—0·61	17·8	1·02	0·340	139

Our conclusions are —

(1) Therapeutically the injection of strong sodium chloride solution is a valuable means of lowering the intra ocular tension effective in the great majority of cases and especially valuable as a pre operative procedure

(2) Following the injection the intra ocular tension falls and the osmotic pressure of the blood goes up, in spite of a large increase in blood volume but it remains to be shown whether the fall in intra ocular tension is more closely connected with the osmotic pressure or with other changes in the constitution of the blood

We are indebted to Dr K Koman Nayar and Mr V Narayana ... Pillai for assistance with the injections and clinical figures and Mr V K ... Pillai for the red blood cell counts

REFERENCE

(1) DUKE ELDER (1926) *Brit Jour of Ophthalmology* Vol X ...

DISCUSSION

Major E O G Kirwan I M S (Bengal) I consider that glaucoma is associated with disease of the arterial system and is a sick eye in a sick body Venous pressure is more closely connected with the intra ocular pressure than the arterial

In India glaucoma is often the result of periphlebitis, mainly in the anterior ciliary veins leading to venous congestion locally, as Magitot and Bullart point out

Inflammatory glaucoma is very common in India and I would like to know from Col Coppinger the treatment he adopts to reduce the tension in these cases

I consider the use of miotics in glaucoma due to epidemic dropsy is futile and waste of time and advocate early operation Elliott s sclero corneal trephine is in my opinion *the operation of choice in these cases* I regard *button holing of the conjunctival* flap a serious accident, and if it occurs before the trephine has been made the trephining should be done at another part of the limbus, if after the trephining, a conjunctival flap should be brought down to cover the opening at once

The paper by Clive Newcomb and Verdon is most interesting and opens up a useful field In India very high tensions are often met with and if their treatment by hypertonic intravenous saline lowers the tension even temporarily, a very great deal has been obtained During this period a decompression operation can be done rather than at a period of high tension

In epidemic dropsy glaucoma, I should like to point out the absence of inflammation, the deep anterior chamber, and regularity of the pupil in all the cases I have seen These are suggestive of a hypersecretion or increased osmosis from the capillaries, due to the toxin produced in the disease, as a cause

Dr J N Duggan (Bombay)

(1) Inquired in what stages the glaucomatous patients come in search of treatment in Calcutta as he finds in Bombay a large percentage of cases come for treatment when operative treatment is hopeless, e g, the glaucoma is entirely overlooked or only diagnosed when the disease has advanced greatly Cases of glaucoma are sent by mofussil doctors as cataract operation cases

TABLE II—*contd.*

Patient Number.	Dose.	Intra-ocular tension before.	Changes in					
			Intra-ocular tension.	Blood volume.	Freezing point.	Total solids.	Percentage of Ash.	Chlorides.
10	0·150	80	—40	134	—0·06	—0·4	+0·06	+0·008
		70	—30					
11	0·129	35	—12	128	—0·03	—1·1	—0·06	+0·015
		40	—15					
12	0·194	60	+ 8	131	—0·06	—0·7	+0·25	+0·039
		30	+ 5					
13	0·151	18	— 5	107	—0·11	—1·5	+0·14	+0·015
		20	— 2					
14	0·134	45	—27	120	—0·07	—2·0	—0·17	—0·015
		42	—26					
15	0·154	60	—15	125	—0·04	—	—	—
		32	—14					
16	0·151	45	— 3	106	—0·06	—	—	—
		20	+ 5					
17	0·123	55	—25	123	—	—	—	—
		50	—15					
20	0·129	45	—10	110	—0·03	—0·8	—0·04	—0·008
		50	—15					
Means	0·139	47	—14	120	—0·044	—1·4	+0·04	+0·016

We have attempted to correlate the various changes shown in the above table but with little success. There is a fair positive correlation between the dose and the increase in the osmotic pressure of the blood, and between the changes in the ash and the chlorides, but beyond this the correlations are not detectable. This is no doubt in part due to the errors in our experiments and to the small number of them, but we think it is also due to the fact that the maintenance of increased tension in the eye is not solely due to the balance between the hydrostatic pressure of the blood and the difference of the osmotic pressures of the blood and the intra-ocular fluids. The cases in which the effect of an injection differs markedly in the two eyes (patients 8, 9 and 17) seem to prove this.

THE OCULAR COMPLICATIONS OF LEPROSY.

BY

MAJOR E O G KIRWAN, I M S
Campbell Medical School, Calcutta

LEPROSY is a chronic, infective granulomatous disease produced by the *bacillus lepræ* and characterized by lesions of the skin nerves and viscera resulting in local anæsthesia, ulceration and a variety of trophic lesions In order that one may understand the ocular complications it is necessary that one should be familiar with the disease as it affects other parts of the body

According to Muir the two cardinal points in the diagnosis are the finding of the *bacillus lepræ* and the presence of anæsthesia The former of these in the skin type and the latter in the nerve type Subsidiary signs are—

1 Deep analgesia which may be found without superficial anæsthesia
2 Loss of the sense of heat and cold which may be found in the area around a spreading patch of anæsthesia
3 Hyperæsthesia
4 Parakeratosis with glossiness of the skin
5 Anhydrosis which may proceed anæsthesia Patches of skin are found dry whilst the surrounding skin sweats freely
6 Thickening of the superficial nerve trunks
7 Trophic ulcers

All of these changes can affect the eye and its annexa just as they affect other parts of the body and so the ocular conditions have no mystery of their own It is important to diagnose the different varieties of leprosy as they affect the body in general As Muir points out all cases are 'nerve' cases to begin with and are dependent upon the number of bacilli in the body The fewer the bacilli the more the disease is confined to the peripheral nerves As the bacilli increase in number the nerve signs become proportionately less and the disease passes on to the 'skin' variety Intermediate cases showing nerve and skin affections must of course be recognized as well as there is no clear cut line between any of the types A patient may often be found who is passing from one stage into another and one part of the body may show 'nerve' signs whilst another may show signs of the 'skin' variety

It is found that a very large percentage of lepers show a positive Wassermann reaction, showing that syphilis coexists with leprosy and certainly, in ocular lesions,

iridectomy. I have not had any complication or any expulsive hæmorrhage with this method.

Regarding my statement ' the earlier the operation is done the better the results ' I do not mean that operation is to be undertaken as soon as the first signs and symptoms of glaucoma appear. In Calcutta, at least, it is very difficult to impress on patients the necessity of being under observation. They invariably come late. There are certain indications on which I decide to operate, and, if the earliest opportunity is given to these cases, better results are always obtained.

Regarding tonometers, I did not say that McLean's tonometer was the best. I happen to have got McLean's instrument and all my cases have been measured with it.

Regarding changes in the field of vision in myopia, I have recently read an article but I have got no statistics to show.

Regarding hæmorrhage in the anterior chamber, Dr. Duggan is of opinion that it is less if the iridectomy is a button-hole one. In my paper I have distinctly said that button-hole iridectomy is my method of choice, although a complete iridectomy could not be helped in three cases. In this connection I would like to draw your attention to the fact that epidemic dropsy cases are very liable to hæmorrhage. Hence the occurrence of hæmorrhage in the anterior chamber in some of these cases. I do not get this in other types of glaucoma.

I agree with Major Kirwan when he says that glaucoma in epidemic dropsy is a symptom—' a sick eye in a sick body,' but I am not of the same opinion with him when he says that miotics are useless in this type of glaucoma. Clinical experience has shown us this. Of course, I admit, that if the causative factor is not treated, miotics alone are useless. The same may be said of operative interference, and that is why, in some cases, increase of tension recurs after operation and two or even three operations become necessary. There is no doubt, however, and I say so emphatically from my clinical experience, that miotics do give palliative results and amelioration of symptoms and recovery when combined with general treatment.

As regards button-holing of the conjunctival flap, I recognize it as a bad complication and it should obviously be our duty to avoid it as much as possible, but I differ from Major Kirwan when he says that all button-holings are serious. A small button-hole does not appear to constitute a dangerous complication as evidenced by my clinical experience and observation. I have watched cases in which such an accident occurred and have found that the opening becomes closed by cicatrization with a result as good as if no such complication had supervened. Of course, it is obvious that I am speaking of small button-holes.

I have listened with great interest to the paper on Intra-ocular Tension by Major Clive Newcomb and Capt. Verdon. It is of great interest to ophthalmologists in that it gives a method of diminishing the intra-ocular tension without touching the eye and I hope that this method will be given a wide trial and definite conclusions reached.

Regarding the statistical paper of Col. Coppinger, I am very glad to find that he is of the opinion that, of all the operations for glaucoma, trephining by Elliott's method and Lagrange's are the best.

The Appendages of the Eye

The eyelids and the eyebrows are very frequently attacked The skin is invaded by a diffuse infiltration and nodules may make their appearance The nodules are small and very seldom ulcerate The intermarginal portions of the lids are the first affected The hairs of the eyebrows and eyelashes become white and downy, they are quickly shed and the eyebrows are represented by prominent, indurated, hairless rolls, making the eyeballs appear sunken The eyelashes of the lower lid are affected first as a rule

In the 'nerve' variety or 'A' type where the bacilli are few in number, anæsthetic patches are found in the lids and eyebrows and are associated with degenerative changes in, and loss of the hairs of the parts The lesion in the nerves leads to muscular atrophy, the orbicularis palpebrarum is particularly liable to be attacked and especially the palpebral portion of the lower lid The lower lid becomes atonic and falls away from the eyeball leading to epiphora and inability to close the eye The ectropion so produced is very common and as a rule only one eye is affected It is the exception to see ectropion of both lower eyelids Occlusion of the lachrymal duct may also account for the overflow of tears due to inflammatory changes in the nose The upper lids may also be affected but not so commonly, leading to drooping of the upper eyelid Likewise paralysis of the extrinsic muscles of the eye may occur leading to deficiency of movement At the same time the cornea and conjunctiva become anæsthetic and so become liable to be damaged by dust wind etc

All the motor branches of the facial nerve communicate with sensory branches of the trigeminal The temporal branch with the auriculo temporal zygomatico temporal and supra-orbital nerves the zygomatic branch with the zygomatico facial infra orbital infra trochlear and nasal nerves By the union of the zygomatic branch and infra orbital nerve an extensive sensori motor plexus is formed below the infra orbital foramen, which is the most important anastomosis between *the facial and trigeminal nerves This probably accounts for the reason why the* palpebral portion of the orbicularis palpebrarum of the lower lid is more liable to be attacked

The nerves of the conjunctiva arise from the infra trochlear branch of the nasal ciliary nerve medially and laterally by the lacrimal nerve A narrow zone of the bulbar conjunctiva around the cornea is supplied by the ciliary nerves which have followed an intra ocular path before piercing the sclera

The nerves of the cornea arise from the ciliary nerves and partly from the nerves of the bulbar conjunctiva Around the periphery they form a plexus, the plexus annularis from which fibres run into the substantia propria, where after a distance of 1 or 2 mm they lose their medullary sheath and ramify in the uppermost layer of the substantia propria Here they form a plexus and then penetrate Bowman's membrane forming another plexus beneath the epithelium and terminate in end organs between these cells From the lesion in the nerves of the eyelids,

one has to consider how much of the lesion is due to sypnilis and how much to leprosy. In the Albert Victor leper hospital, Calcutta, out of 150 patients 42 per cent showed positive Wassermann reactions. In the same institution, out of 25 European and Anglo-Indian patients 13 were positive. It is now universally agreed that the eye is frequently involved in leprosy, but actual statistics vary enormously.

In the Albert Victor leper hospital, Calcutta, out of 155 indoor patients 36 per cent in European and Anglo-Indian patients and 20 per cent in Indian patients show ocular complications These figures include the eye and its appendages. But it must be realized that in this hospital, one is dealing with cases of leprosy of long-standing duration, varying from 5 to 50 years with an average duration of 9 years. It is surprising that more of the patients have not ocular complications as undoubtedly in India the eye lesions in the generality of cases are a late manifestation of the disease. In Muir's outdoor clinic in the Calcutta School of Tropical Medicine, where many early cases which are clinically positive but bacteriologically negative are picked out, eye complications are comparatively uncommon. No accurate statistics are available at present, but a rough estimation would be about 3 per cent.

Neve in Kashmir found eye complications in 20 out of 80 lepers in the State leper asylum.

De Silva working in Siam found 101 cases of ocular complications out of 500 lepers.

Pinkerton working in Hawaii found 323 cases of ocular complications including the appendages out of 363 cases. Forty were therefore unaffected.

Lopez in Havana found that every single case of leprosy showed some lesion of the eye or its annexa at some part of its course.

Wood in South Africa found ocular complications in some form in nearly all cases

Chance states that ' the incidence of ocular symptoms bears no relation to the duration of the general disease but may come on at any time in its course, although it is not found usually till several years have elapsed.'

Morrow and Lee say that ocular lesions occasionally occur quite early in the disease.

There is, therefore, a very wide difference in the occurrence of ocular complications in the various countries and climates. Why its behaviour should be like this is interesting and requires investigation.

The eyebrows are usually involved early in leprosy. They are thickened and infiltrated and if the eyebrows be included in the annexa of the eye, the percentage of ocular complications will be considerably increased. In the Albert Victor leper hospital, Calcutta, 86 per cent of the cases showed involvement of the skin of the eyebrows.

In reply to Dr Victor Rambo The prognosis in early cases of iridocyclitis is good if the pupil reacts to atropine, otherwise it is bad as regards vision The prognosis of early keratitis cases is good and operative results in these cases are very satisfactory General treatment should be continued in all ocular lesions

In reply to Dr Lsch Keratitis is usually due to exposure and anaesthesia The eye should be protected accordingly In cases of lepromatous pannus, a peridectomy is very successful in preventing the spread of the keratitis In early iridocyclitis, the sheet anchor is atropine General treatment is of extreme importance The more debilitated the individual, the more difficult it is to treat ocular leprosy

REFERENCES.

ELLIOTT, R. E. (1920) .. .. 'Tropical Ophthalmology.'
FUCHS, E. .. .. .. Textbook of Ophthalmology.
DE SCHWEINTZ, G. E. (1924) .. .. Diseases of the Eye.
MANSON-BAHR (1925) .. .. Tropical Diseases.
OSLER, SIR W., and MCCRAE (1925) .. System of Medicine.
LEVE, A. (1900) .. .. .. *Brit. Med. Jour.*, May.
DE SILVA, W. H. (1908) .. .. *The Ophthalmoscope.*
PINKERTON, F. J. (1927) .. .. *Arch. of Ophth.*, January.
LOPEZ, E. .. .. .. *Arch. of Ophth.* Bd. XVIII, S. 404.
WOOD, D. J. (1925) .. .. *Brit. Jour. Ophth.*
CHANCE, B. (1916) .. .. .. *Ann. of Ophth.*
MORROW, H. and LEE, A. W. (1915) .. *Jour. Amer. Med. Assoc.*
AXENFELD, T. .. .. .. *Klin. Monatsbl. Augenh. Stuttgart.* Bd. IIV, S. 517.
TRANTAS (1899) .. .. .. *Bull. et. mem. Soc. franc. d'ophth.*

DISCUSSION.

Dr. B. N. Bhaduri (Bengal): I would like to know whether heat or cold sensation disappears first or the anæsthesia sets in at the beginning. I have seen one case in which heat and cold sensation disappeared first and anæsthesia appeared later and I believe some authorities on leprosy hold this view which is contrary to what the opener of the debate put forth.

Secondly, I would like to know whether the speaker ever injected ox gall or sodium taurocholate and glycocholate subconjunctivally as has been advocated by Wood of South Africa who noticed improvement after its use in chronic iridocyclitis cases. The prognosis of these chronic iridocyclitis cases is extremely bad. They lead gradually to blindness.

Dr. J. N. Duggan (Bombay): Asked whether or not eyes are lost by iritis or corneal ulcer - the effect of iridectomy. Is it always successful? Whether Major Kirwan had observed polycoria due to atrophy of the iris in spots; and the incidence of cataract in leprous cases?

Dr. V. C. Rambo (Central Provinces): I would like to ask Major Kirwan what the prognosis is in the various types of leprous lesions he has described, and in which of these lesions is it necessary to discontinue general treatment?

Dr. C. D. Esch (Central Provinces): Asked Major Kirwan what could be done in early cases of keratitis and iridocyclitis in leprosy to prevent their further development.

Major E. O'G. Kirwan, I.M.S. (Bengal):

In reply to Dr. Bhaduri: I have not been able to observe whether heat or cold sensations disappear before anæsthesia. Usually both are absent at the same time. I have no experience with subconjunctival injections of gall-bladder fluid or sodium glycocholate in cases of iridocyclitis.

In reply to Dr. Duggan: Blindness was due to corneal and iris inflammations. The percentage of each was about equal. The effects of iridectomy were good at first but later the pupil filled up with exudate so that the final results were disappointing. Polycoria is quite a common condition in ocular leprosy.

with different antiseptics without any appreciable improvement, on the other hand it gradually progressed Injections of hydrarg and novarsenobillon were given on the strength of some positive clinical evidence of syphilis The condition was diagnosed as Mooren's ulcer at the beginning of the fifth month and at the end of the sixth or seventh month a little less than the upper third of the cornea was involved Extensive cauterization was done after the diagnosis was made which checked the progress of the disease for a month or so but it again began to spread and combined peritomy and cauterization did no good The primary corneal lesion appeared in this case as a localized haziness followed by vesicle formation and growth of conjunctival vessels There was no pyogenic infection of the ulcer during its course

My second patient came under my treatment in the late stage of the disease about three years after its onset This was in a Mahommedan merchant aged 58 years, who came from Multan in the Punjab and in whom the whole of the right cornea was involved excepting an area of about half a square centimetre near the centre *The left cornea was completely covered From the history of the case* and the prescriptions which he produced before me it was evident that he had long been treated as trachoma There was no particular change in the eyelids *excepting their conjunctival surface which had been touched with copper sul*phate on several occasions His left eye had been operated on several times and had a symblepharon in the lower temporal region, causing partial ectropion of the lower lid The picture of the right cornea gave me the clue to the diagnosis of the disease in both eyes and I cleared a portion of the left cornea and cauterized with tincture of iodin and at the same sitting corrected the symblepharon using a mucous graft and then stitching the eyelids together The immediate result was gratifying to the patient and he wanted me to operate on his better eye but before long the operated eye got worse as far as the ulcer was concerned and so I did not operate on the other eye The patient was under my observation for a long time and although the disease progressed there was no perforation

The other three cases which I have seen do not merit separate description but all of them belong to the poorer class and are all Mahommedan male adults This may be a mere coincidence The only Hindu patient I have had occasion to see was in Col Coppinger's ward in the eye infirmary

We all know that this disease is of unknown ætiology *H Lang* (2) reported a case of Mooren's ulcer where the eyeball was removed for pain and on histologic examination nothing could be found to account for the necrotic process being limited to the superficial layers *of the substantia propria of the cornea nor* was he able to establish an ætiologic factor in this case It has been suggested by many, particularly by Junius that this disease belongs to the group of corneal *diseases of neuropathic origin*

The cases, eight in number which I happened to see did not show any in the sensibility of cornea I tested the sensibility of cornea of my

REFERENCES.

ELLIOTT, R. E. (1920) .. .. 'Tropical Ophthalmology.'
FUCHS, E. .. .. .. Textbook of Ophthalmology.
DE SCHWEINTZ, G. E. (1921) .. .. Diseases of the Eye.
MANSON-BAHR (1925) .. .. Tropical Diseases.
OSLER, SIR W., and MCCRAE (1925) .. System of Medicine.
LEVE, A. (1900) .. .. .. *Brit. Med. Jour.*, May.
DE SILVA, W. H. (1908) .. .. *The Ophthalmoscope.*
PINKERTON, F. J. (1927) .. .. *Arch. of Ophth.*, January.
LOPEZ, E. .. .. .. *Arch. of Ophth.* Bd. XVIII, S. 401.
WOOD, D. J. (1925) .. .. *Brit. Jour. Ophth.*
CHANCE, B. (1916) .. .. .. *Ann. of Ophth.*
MORROW, H. and LEE, A. W. (1915) .. *Jour. Amer. Med. Assoc.*
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wound was dressed as usual The patient had an attack of malarial fever during his stay in the hospital but his eye wound had an uneventful recovery The affected portion of the cornea appeared translucent the extension of the ulcer was checked and he was discharged, cured from the hospital a few weeks after

Two other cases were admitted to the eye infirmary, one of whom refused to undergo operation This latter patient, aged 38 years was admitted to hospital on 27th August 1927, with a history of eye trouble of nine months duration The cornea was three fourths ulcerated and ciliary infection was present He stayed for a fortnight in the hospital and went away on the day of operation The other patient S P a Mahommedan bearer, aged 10 years was admitted on 13th August 1927, with a history of lachrymation photophobia pain and redness in the right eye for four months Impairment of vision was noticed for the last two months He was treated by a hakim with indifferent results A diagnosis of ... was made in the hospital and the blood being strongly positive ... for the Wassermann reaction, the patient was given anti syphilitic treatment during his stay in hospital A similar conjunctival hood operation was performed ... eye by Col Coppinger on 15th August 1927 and the patient made ... there being no progression of the ulcer since then This patient's vision improved slightly after the operation

One cannot say whether the result will last for a long period or not as the operations were done only a few months ago, but the immediate benefit was very satisfactory

I take this opportunity to thank Col Coppinger for allowing me to publish these three hospital cases and for giving me every facility for work in the hospital and permitting me to make use of his library

REFERENCES

(1) Ball (19 6) Textbook of Ophthalmology pp 411 ...
(2) Feingold H (1921) ... Jour Ophth, Vol IV, pp 161—1 0

DISCUSSION

Dr P K Banerjea (Bengal) I just want to cite a case of Mooren's ulcer that is at present an in patient in the eye infirmary

This patient has an ulcer (Mooren) at the ... margin of the cornea which is spreading along the margin rather rapidly When I first saw it it was about ... long and in 15 days time it was nearly double that length in spite of all our treatment medicinal and constitutional and a single cauterisation at the beginning This patient has not a high intra-ocular tension as Dr Bladurn suggested that it may be in such cases The patient has a moderately positive Wassermann reaction and is having treatment by bismuth injections and novarsenobillon This seems to have no effect in checking the progress of the ulcer

Dr U R Jesual (United Provinces) I would like to say a few words on the treatment of Mooren's ulcer which I have found most satisfactory ...

about five months after the onset of the mischief, that is, after I diagnosed it as a Mooren's ulcer.

Tonometry was not done in any of these patients so that changes in ocular tension, if any, through nervous influences, were not discovered. Infiltration formation of vesicles and necrosis which usually appear in peripheral nerve lesions was noticed in one case which I was fortunate enough to come across from the very beginning of the trouble. There was no dryness of cornea and conjunctiva as we find in other forms of keratitis of neuropathic origin. In fact lachrymation and, in some degree, other signs of irritation were all along present in our patients though in the late stage irritative symptoms were less marked in comparison with the severity of the corneal lesions. I have mentioned this fact as some consider that the lesion lies in the trigeminal nerve in a number of cases of this ulcer.

It is needless for me to describe the different measures usually adopted to treat this condition. Failure to check the progress of the ulcer leads us to adopt measures which we would not otherwise attempt in corneal lesions, but so far none of the measures seem satisfactory. In judging the result we are to remember the abortive type of Mooren's ulcer but so far I have not met any. Cauterization is extensively practised. The disease is limited to the superficial layers. In fact, the epithelial layers, Bowman's membrane and only a superficial portion of the substantia propria are involved and we know that there is little or no attempt to form fibrous tissue in the healing process, there being definite loss of the tissue substance. It is, therefore, essential that we should cauterize if possible in such a way as to produce least damage to the underlying layers of healthy cornea. This, perhaps, can best be attained with Shahans' thermophore in which we can regulate the temperature and so make full use of selective thermotherapy.

As I have no practical experience of the instrument, however, I will not enter into the results which one might obtain but would rather describe the two cases where progress of the ulcer was definitely checked for at least a few months (they were operated on about 3 or 4 months ago), after conjunctival keratoplasty.

The first case--Niamuddin, Mahommedan male, aged 32 years, was admitted to the eye infirmary, Medical College, for the treatment of a Mooren's ulcer on 11th August, 1927. A history of three months' duration was given. The disease started with a gritty sensation, redness and pain in the right eye. The patient received treatment outside for some time and though pain lessened, the gritty sensation, redness and lachrymation persisted. The upper quarter of the cornea was involved. He was operated by Col. Coppinger on 12th August, 1927, under local anæsthesia. The conjunctiva was separated at the limbus with a pair of scissors along the whole of the affected area, and the ulcer was scraped with a sharp scoop, a gelatinous-looking material was separated out. The conjunctiva was then undermined from the limbal end and the separation was done sufficiently, so that, when drawn down, the hood covered the raw surface completely and was held in position by two stitches, passed through the lower bulbar conjunctiva. The

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REFERENCES

(1) BALL (1926) 'Textbook of Ophthalmology pp 119 [illegible]
(2) FINGOLD, H (1921) *Brit Jour Ophth*, Vol IV pp 161—1[illegible]0

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It is needless for me to describe the different measures usually adopted to treat this condition. Failure to check the progress of the ulcer leads us to *adopt* measures which we would not otherwise attempt in corneal lesions, but so far none of the measures seem satisfactory. In judging the result we are to remember the abortive type of Mooren's ulcer but so far I have not met any. Cauterization is extensively practised. The disease is limited to the superficial layers. In fact, the epithelial layers, Bowman's membrane and only a superficial portion of the substantia propria are involved and we know that there is little or no attempt to form fibrous tissue in the healing process, there being definite loss of the tissue substance. It is, therefore, essential that we should cauterize if possible in such a way as to produce least damage to the underlying layers of healthy cornea. This, perhaps, can best be attained with Shahans' thermophore in which we can regulate the temperature and so make full use of selective thermotherapy.

As I have no practical experience of the instrument, however, I will not enter into the results which one might obtain but would rather describe the two cases where progress of the ulcer was definitely checked for at least a few months (they were operated on about 3 or 4 months ago), after conjunctival keratoplasty.

The first case—Niamuddin, Mahommedan male, aged 32 years, was admitted to the eye infirmary, Medical College, for the treatment of a Mooren's ulcer on 11th August, 1927. A history of three months' duration was given. The disease started with a gritty sensation, redness and pain in the right eye. The patient received treatment outside for some time and though pain lessened, the gritty sensation, redness and lachrymation persisted. The upper quarter of the cornea was involved. He was operated by Col. Coppinger on 12th August, 1927, under local anæsthesia. The conjunctiva was separated at the limbus with a pair of scissors along the whole of the affected area, and the ulcer was scraped with a sharp scoop, a gelatinous-looking material was separated out. The conjunctiva was then undermined from the limbal end and the separation was done sufficiently, so that, when drawn down, the hood covered the raw surface completely and was held in position by two stitches, passed through the lower bulbar conjunctiva. The

OCULAR FINDINGS IN AMŒBIC DYSENTERY.

BY

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Ever since the publication of the case of iritis due to amœbic dysentery by R. P. Luna in 1918, we not infrequently meet with reports of such cases Such reports generally come from countries in the temperate zone whereas the incidence of amœbiasis is far greater in the tropics

Very few, if any, cases of ocular lesion due to amœbiasis have been reported from our country as far as my knowledge goes, so I venture to place before you a few cases that I have come across

Case I. Mrs D, a Hindu widow, aged 50 years, had an attack of iritis in both eyes followed by an attack of acute dysentery on the fourth day after the appearance of eye symptoms She was given atropine locally and the eye troubles quickly subsided after a week when emetine was given for her dysentery, the stool examination report showing the presence of *Entamoeba histolytica* She was given altogether three half grain doses of emetine hydrochloride intramuscularly Since then she has suffered from diarrhœa and constipation alternately with the occasional appearance of mucus and blood in the stool Occasionally she gets an attack of pain lachrymation and redness in her eyes All along she had been treated either by a homœopath or a kaviraj She noticed impairment of vision, and, during an attack of eye symptoms, went to the hospital There a diagnosis of iritis was made and her blood tested for Wassermann's reaction and found negative She received bismuth and sulfarsenol injections and iodide per os but the condition persisted When she was brought to me, she complained of pain and lachrymation in her eyes, headache, pain in the joints, a feeling of lassitude and general weakness with aversion for food

Examination revealed a normal tension, a slightly swollen upper right eyelid, circum corneal injection in both eyes, slight corneal infiltration and a fixed pupil Irregular and contracted posterior synechiæ were manifested later on under a mydriatic Vision in the right eye was 6/24 and in the left 6/18 Her pupils dilated under strong atropine drops and she was given four injections of emetine hydrochloride, one grain per dose every alternate day, after which she developed the toxic effects of the drug She was then given 'Yatren 105' and ipecacuanha preparations orally She was cured in a month and since then she has had no eye trouble for about a year when I last enquired about her.

Case II Mr. A, aged 57 years, Hindu male, suffered from dysentery several times He was operated on for liver abscess in the hospital about eight years ago His eye trouble started about four years after the operation and was then diagnosed as iritis His blood was examined at that time for Wassermann's reaction and was found negative He was first given salicylates and was then put on hydrarg and iodides for a long time Afterwards he received a course of neosalvarsan injections. Recurrences of the eye trouble were frequent, about three attacks every year. A trial of non-specific protein therapy did no good. Some of his teeth were taken out and the others were cleaned for pyorrhœa and he also received a course of gonococcal vaccine for his arthritis. It was three years

operative treatment described by Dr. Bhaduri, other treatments, in my opinion, are of great importance without which the operative treatment cannot be successful.

(1) *Hygienic.*—The patient should be kept free from dust and a smoky atmosphere and the glare of the sun. For this he cannot do better than to put on dark smoked glasses. He should be allowed to enjoy the best possible climate to improve his general condition.

(2) *Dietetic.*—He should be given a non-stimulating nourishing diet so that the stomach may not be taxed and constipation arrested.

(3) *Medicinal.* For improvement of the general health some tonic should always be given as the ulcer is generally seen in people of poor physique.

(4) *Surgical.* In addition to cauterizing and the conjunctival hood operation, an intramuscular injection of sterilized milk 10 c.cs. in the gluteal region should be given and after a week four or five intravenous injections of iodine every fourth day.

℞ Iodi	..	..	gr. 6
Pot. Iodidi	..	..	gr. 10
Aqua distillata	..	..	oz. 1

This treatment has given very good results in these cases. Such a course of treatment, if undertaken, not only cures the ulcer, but checks the recurrence of the disease which I have often seen in my cases at Mainpuri in the United Provinces.

Dr. S. K. Mukerjee (Bengal). As Mooren's ulcer is a rare disease, it is not possible for us to see many cases. I came across two typical cases, both of them were in old patients. The ulcer started at the upper part of the corneal margin and gradually spread over the entire cornea. Just while one part was healing, a relapse set in involving another part, with a return of symptoms of irritation and the ulcer became of a chronic serpiginous type. All possible precautions and treatment failed to check the progress of the disease till the entire cornea was involved. After healing there was not much opacity, but half the thickness of the cornea was lost. The ulcer did not penetrate deeply and there was no perforation in either of my cases. It was a slow necrotic process involving the superficial layers of the substantia propria. No keratectasia nor any vascularization was seen afterwards. It will be a great boon if something can be done to check the progress of such a locally malignant type of ulcer.

I have brought this point to your notice simply because the chart of chronic iritis cases under observation for ten or twelve years published by Brown and Iron(1) of Chicago showed in a large percentage (12 per cent) disappearance of recurrence after the removal of infected teeth, which had been blamed as the cause of the iritis My second case responded to anti amœbic treatment only The improvement noticed in the healing of the ulcer of the cornea under emetine treatment cannot be too much emphasized As Elliot(2) has pointed out 'any debilitating disease or indeed, any factor which materially and unfavourably influences the nutrition of the body at large, is apt to be associated with various forms of keratitis and corneal ulcer' 'Moreover, the predisposition to these unfortunate conditions is very great in the countries where dysentery is rife '

The loss of accommodation and its reappearance after emetine treatment puzzled me all along till I read about Collins'(3) cases He ascribed the effect upon accommodation to disturbance of the small cortical psychomotor centre of accommodation through a toxin or perhaps anti toxin This, however, is a matter of opinion

REFERENCES

(1) BROWN and IRON (1926) Recurrence of iritis as influenced by the removal of infection *Jour Amer Med Assoc* October

(2) ELLIOT (1923) Tropical Ophthalmology p 4..

(3) COLLINS (192.) Paresis of accommodation in amœbic disease The Ophthalmic Year Book of ATO Vol. XXII, p 42

DISCUSSION

Major E O G Kirwan I M S (Bengal) I consider that intestinal complaints are responsible for a large amount of iridocyclitis in Bengal In many cases of acute and chronic iridocyclitis the Wassermann s reaction is negative, the teeth, throat, and nasal sinuses are healthy and the source of infection comes of the intestine

I consider that iritis in amœbic dysentery is due to the secondary infection which comes from amœbic ulcers Emetine gives good results in most cases Amœbæ are, however, only one of many organisms in the bowels which cause iridocyclitis

Dr S K Mukerjee (Bengal) I have had the opportunity of getting a few cases of ocular affection associated with amœbic dysentery Uveitis was mainly seen In one case only I found retinitis with small hæmorrhages I agree with Major Kirwan *that it is very difficult to connect such affections with dysentery, oral sepsis, septic* conditions of the teeth and of the pharynx and accessory sinuses, and other factors are so common in patients here that it is not possible to say that a particular ocular affection is due to the amœbæ unless we have definite proof by finding the organism either in the aqueous or in the iris tissue itself It may be possible that the dysentery, by lowering the vitality of the patient, opens up the path for the entrance of other micro-organisms, such as staphylo and strepto-cocci into the blood stream, and that these bacteria settle in the uveal tract and produce inflammation

after the onset of the iritis when he came to me during a period of exacerbation of his eye symptoms. His vision was reduced to 6/60 in the left and 6/36 in the right eye. He had chronic iridocyclitis in both eyes and there was no rise of tension. He was first given a few injections of bismuth without any marked improvement and when I got from him the history of liver abscess which he had somehow forgotten to mention before, I put him on emetine hydrochloride. He was given three doses of one grain and three half grain injections, when he showed the toxic effect of the drug. He improved considerably under the treatment. It is more than a year since he received the treatment and so far he has been free from recurrences.

Case III. A. C., aged 60 years, Hindu male, consulted me for ulcer of the cornea in the left eye last February. The right eye had been enucleated in a hospital when he was treated for a corneal ulcer in that eye. When I saw him, he was bed-ridden with an attack of acute dysentery and was on a saline mixture. The ulcer was of more than a week's duration and was being treated with iodoform and atropine ointment. On examination a big ulcer occupying the middle third of the cornea, obscuring the vision completely, was noticed. It was rather deep centrally as was found when it was scraped with a sharp spoon and afterwards cauterized with carbolic acid. The spread of the ulcer was not checked and so it was touched with the thermocautery twice within a week with unfavourable results. In the meantime, it was decided to put the patient on ipecac. derivatives for his dysentery. After the second emetine hydrochloride injection, the progress of the ulcer was checked and it improved rapidly in a fortnight, leaving only a central opacity of the cornea. From the history of the patient we came to know that he had been treated in the hospital for dysentery several times, both as an in- and out-door patient.

Case IV. A student, P., aged 21 years, son of a medical practitioner, was brought to me by his father for impairment of near vision of three weeks' duration. The boy had had an attack of dysentery which had reacted to two half grain injections of emetine hydrochloride. The patient found difficulty in reading books about two weeks after the cure of his dysentery. On examination the pupils were found reacting rather sluggishly, distant vision 6/6 in both eyes. He took about +4·50 D S to read Sn D=0·75 at 12 inches distance, separately with each eye. When examined under homatropine, he took only + 0·50 D S in both eyes. In the retinoscopic examination, the media and the fundus showed normal appearances. I advised him to leave his eyes alone for some time and requested the father to treat him for his dysentery as the boy was still complaining about it. He was given anti-amœbic treatment and near the end of the treatment he regained his near vision.

The establishment of an association between general disease and eye lesions is more or less guesswork, and all the more so, when the particular organism has never been found in eye tissues. The benefit obtained from therapeutic tests, however, specially when the result is lasting, should make us less tardy in accepting and recognizing the significance of such an association.

In only two of these cases (I and IV), was the amœba found in the stools, and in the other two emetine was given on clinical evidence alone.

The two iridocyclitis cases presented the usual articulo-ocular syndrome, though in the Case I, the articular symptoms were not very definite. In my first case, iritis appeared first and the dysentery later on and the eye lesion cleared under anti-amœbic treatment. This patient might have been a carrier all along. The second patient had a septic focus in his teeth which was attended to without freeing him from recurrences. Bad teeth, however, are not uncommon in Bengal. If the teeth of a large number of chronic iritis patients are examined, very few are found to be free from septic teeth. It would be interesting to know whether this focus keeps up the chronic uveal inflammation after the disappearance of the primary cause of the mischief.

MILK THERAPY IN EYE DISEASES.

BY

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WITH recent advances in medicine one notices that new remedies crop up either to displace or to help the older ones in their action Some of these simply catch the fancy of the medical profession for the time being while others come to stay because they have stood the test of time Notably among these have been the foreign proteins for the treatment of various acute and subacute diseases of the anterior segment of the eyeball Out of the several foreign proteins e g anti diphtheritic serum typhoid vaccine normal horse serum aolan ciballbumen caseiosan, yatren casein various albumoses proteoses and peptones used in the foreign protein therapy only milk has been chosen to form the subject of this paper Thur Dec 10 A 1 P M

Mode of action —Several theories have been put forward to explain the therapeutic effect of this kind of therapy but up to now none alone can do it satisfactorily In order to explain the probable mechanism of its effect one has to deal with the questions of immunity anaphylaxis cellular sensitization and desensitization and possibly the physico chemical relation to infections Instead of discussing the pros and cons of these various theories I would like to remark that the introduction of milk which is a non specific protein into the system increases the natural defensive forces of the organism and produces a reaction febrile or afebrile which helps the organism to fight against the infectious agent and ultimately destroy it Further *it is characterized by the production of marked phagocytosis and haemolysis* which, in its turn liberates globulin which acts as a foreign albumen Besides, a definite systemic reaction as mentioned above i e moderate rise of temperature with malaise is believed to be necessary because remedies like aolan ciballbumen and yatren casein which do not produce it can hardly be said to possess any satisfactory therapeutic effect Jon Dr Kev of New York city attributes the establishment of the pre anaphylactic stage of hypersensitivity and thereby the increase of the resistance which is the therapeutic effect

Indications for use —*The following are the eye conditions in which milk* injections have proved efficacious –

Gonorrhoeal ophthalmia hypopyon ulcer trachomatous pannus and ulcers, penetrating wound of the eyeball, keratitis—syphilitic or phlyctenular, iridocyclitis,

Dr. J. N. Duggan (Bombay): said that besides iritis, cyclitis, choroiditis and vitreous opacities are also found, there being no other causation such as teeth trouble present in these cases. He had also observed a case of retinal hæmorrhage like a large subhyaloid hæmorrhage which took four months to disappear in a young lady of 26 after a dysenteric attack. There was no other cause to account for it. Amœbæ were found in the stools and she was treated with emetine.

cases, relapses are not uncommon during the course of injections specially in sub-acute cases of phlyctenular keratitis which call for greater perseverance.

Illustrative cases.—A large number of various eye diseases has been treated during the past five years with remarkable success, but here only a few of these will be quoted below.

Case 1.—A boy, aged 10 years, had double interstitial keratitis. He was given the stereotyped treatment for the complaint for about two months without success. The patient could not open his eyes because of the photophobia and lachrymation, which disappeared like magic after the second injection. He received in all 12 milk injections. The cornea cleared up rapidly. The boy has been kept under observation for one year.

Case 2.—A girl, aged 12, had a severe attack of phlyctenular keratitis of right eye a couple of years ago. Ever since she had been treated for relapses with various measures without any effect upon the disease. Lately she came under my observation during a relapse. A couple of injections of milk not only caused her photophobia, lachrymation and ciliary infection to disappear, but the corneal infiltrates got considerably absorbed causing the pupil to dilate widely with atropine which could not be done previously. Unfortunately, there was a relapse before the fourth injection could be given, but the case has been brought under control and is progressing favourably.

Case 3.—A man, aged 40 years, had been suffering from severe iridocyclitis with *occlusio pupillæ* for the past four months. After giving a fair trial to cyanide injections and the usual measures, milk injections were started as no improvement was noticed. The eye quieted down remarkably quickly after the first injection. After receiving a further course of 5 injections, the eye has remained quiet ever since.

Case 4.—A girl, aged 18 years, had acute iritis of the right eye with a few spots of K. P. With an anti-syphilitic line of treatment and atropine, the case quieted down after a month but afterwards she got one or two relapses. Hence a couple of milk injections were given with very good effect—the eye remaining quiet ever since.

Case 5.—A Parsi lady was operated on for glaucomatous cataract in the left eye. In the next month a preliminary iridectomy was performed in the right eye and, a month later, cataract extracted from this eye. She had a severe iridocyclitis each time following upon the operations. A fair trial was given to routine measures, but the inflammation did not yield to treatment. Her most distressing complaint was œdema of the lids and a marked photophobia accompanied by pain in the eyes and headache. Aspirin was out of question in her case as she had an idiosyncrasy for the drug. Milk injections were tried. Within three injections her œdema disappeared, pain and headache were relieved and the photophobia became less. The eye became nearly white and the K. P., which was present in the right eye, disappeared. Two more injections were necessary to drive away the remaining photophobia and a few other minor complaints.

Case 6.—Mr. A. was operated on for cataract. A slight bead of vitreous presented during the stage of replacing the iris. For two days the eye was quiet. On the third day it showed signs of threatening suppuration—a steamy cornea, yellowish cortex, marked chemosis, œdema of the lids and severe pain. Two aolan and a cyanide injection were given to no effect. The first injection of milk cleared the cornea and the cortex, which formed a thick mass in the pupil, was broken up into shreds. Two more injections were necessary to clear up the whole process. This is a typical case where the eye was saved magically by milk out of the clutches of post-operative infection. Besides, it also establishes the value of fresh milk over the proprietory products of milk like aolan.

Case 7.—Another case of cyclitis following upon cataract operation in a woman, aged 65, did not yield to the routine treatment, but improved rapidly with a course of 5 injections of milk.

Case 8.—A man, aged 40, suffering from granular lids had the cornea of his left eye attacked with ulcers and a thick progressive pannus. He was treated with the usual line of treatment but without any benefit. Atropine did not dilate the pupil sufficiently well. After one milk injection the pannus disappeared and the pupil dilated widely with one instillation of atropine. Two more injections were given to effect a complete cure of his trouble.

sympathetic ophthalmia, post-operative complications after cataract extraction, e.g., iritis and suppuration in the flap in the early stage, hæmorrhages in the vitreous and retina. They are also used as a prophylactic measure in certain cases where there is reason to fear infection after cataract extraction. All these affections to be treated must be either acute or subacute to obtain good results. In chronic diseases they never give any relief to the patient, but exacerbations in these are amenable to this line of treatment.

Method of administration, dosage and its after-effects.—Cow's or buffalo's milk is used for these injections. The dose varies usually from 5 to 10 c.cs. for adults, occasionally increased to 20 c.cs. For children it is from 3 to 5 c.cs. The intramuscular route is particularly suitable for these injections. The injection is made preferably in the gluteal region or, failing this, in the deltoid. It should be placed deep into the muscle or beneath its adipose layer. Fresh milk is filtered in a test tube which is then plugged with cotton-wool and placed in a water-bath and the water is allowed to boil for at least five minutes. After allowing the milk to cool down to body temperature, the required quantity is taken up in a sterilized syringe and injected slowly after observing the necessary precautions to sterilize the skin. The subsequent injections are given at intervals of 2 days. The number of injections has varied from 6 to 12 according to the severity of the disease.

A couple of hours after the injection, the patient complains of pain and tenderness in the arm (if that is the site of injection) which begins to get swollen, the swelling usually taking two days to subside. Systemic reaction manifests itself 4 or 5 hours after injection by a rise of temperature which may range from 99° to 105°F. accompanied generally by chilliness, headache, general malaise, quickening of pulse and respirations and occasionally delirium. In this connection one interesting observation was that in one of my cases there was no fever but the patient complained of a sensation of great heat, only in the axillæ which required to be constantly fanned. The reaction varies with the susceptibility of patients and its intensity becomes moderate after subsequent injections. The fever usually lasts from 10 to 12 hours and comes down by lysis accompanied by free perspiration. In the next 24 hours after the injection, the patient feels markedly nervous and weak.

Within 24 hours an amelioration of the signs and symptoms is definitely noticed and if there is none after the first 2 or 3 injections, no improvement in the eye condition should be expected. In this connection it may be said that milk is blamed for not possessing a constant composition and this fact may be held responsible to explain the absence of reaction or its ineffectiveness in a certain class of cases. If so, it is worth while changing the source of supply and trying a fresh quantity. The pain in the eye either disappears or becomes much less. Photophobia and lachrymation almost disappear. The ciliary infection begins to fade away rapidly. The media, if previously hazy, begin to look clear. Atropine, which was not capable of dilating the pupil, now causes full dilatation. In the majority of cases the change for the better is not temporary, but, in certain severe

TRACHOMA.

BY

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My chief reason for choosing this subject is because of the great divergence of opinion about the correct diagnosis and the greater divergence of opinion about *its treatment* *When the cause of any disease is still unknown,* there must be many theories as regards its ætiology I do not propose however to make any long winded statement about this It would serve no useful purpose I propose, as regards its prevention, to put forward suggestions which I hope will be discussed and on which valuable opinions as regards diagnosis and treatment will be made

What is trachoma? It is a chronic conjunctivitis affecting only the palpebral part of the conjunctiva except in very rare cases This fact probably leads to the question If trachoma is such a contagious disease as we are led to believe, why does it not spread to the bulbar conjunctiva in all cases? The diseased palpebral conjunctiva is in constant contact with the bulbar conjunctiva and still only in rare cases do we get the bulbar conjunctiva affected I am afraid we cannot answer this question until the cause of the disease is discovered Instead it is the cornea which is more often attacked, pannus and ulceration being the commonest affections We are told that pannus is not due to the rubbing of the granular upper lid on the cornea Still if the upper bulbar conjunctiva is ballooned up with an injection of potassium iodide solution of about 20 grains to an ounce, an improvement in the pannus will occur Is the improvement due to the swelling of the bulbar conjunctiva preventing the upper lid rubbing on the cornea, or is it due to the medicinal qualities of the medicine?

Diagnosis

The *diagnosis* of trachoma is difficult in many cases In this country we find a very large number of cases of simple chronic conjunctivitis This is, to a great extent, due to constant *irritation from dust, smoke etc, and to refractive* errors In many of these cases there is a granular condition of the palpebral conjunctiva, but in all cases the bulbar conjunctiva is also affected Besides this, we usually find that trachoma is complicated by a secondary infection This is

Inflammations of the uveal tract are particularly favourable for milk therapy. Amongst uveal inflammations, one meets with many intractable cases of cyclitis and iridocyclitis which at times tire the patience of the surgeon. Milk acts like a charm in such cases and brings them to a successful termination much more rapidly than one would imagine.

In conclusion, I would like to draw attention to the fact that milk therapy is not a cure-all. Even though remarkably good results have been obtained in the majority of cases, in some it will fail. In such cases it is said turpentine injections will act better, but I have no experience of this remedy. Besides, milk therapy was never meant to take the place of older measures and remedies such as atropine and cauterization in hypopyon ulcers, etc.

DISCUSSION.

Dr. B. C. Vachharajani (Bombay) : I have been using milk injections in 10 c.c. doses for the last two years in serous iritis, purulent conjunctivitis, ulcers of the cornea and in cases after cataract extractions, where the operation has been prolonged, and it has given me quite good results ; but in some cases it fails.

Dr. F. Maya Das (United Provinces) : Is there much danger of anaphylaxis in milk injections ? This fear has always haunted me when considering the question of a second or third injection. I seldom give more than one injection of 10 c.cs. of milk subcutaneously but have got very little result.

Major J. N. Duggan, I.M.S. (Bombay) replied : The dose of milk is 5 to 10 c.cs. in adults and 2 to 3 c.cs. in children. There is no shock if the milk is prepared by filtering through filter paper and boiling in a water-bath.

tarsal plate and near the upper margin of it If this scarring is present, it is pathognomonic of trachoma If there is much scarring, one of its sequelæ, viz, entropion, trichiasis, will also be present The lashes may not touch the cornea but the sharp edge of the tarsus does and produces very much the same results as if the lashes had touched it It should not be thought that the case is not one of trichiasis simply because the lashes do not touch the cornea It is altogether a matter of degree

If there is a secondary infection present the scarring will be blurred A case of conjunctivitis should not therefore be diagnosed as trachoma until the secondary infection has been cleared up The bulbar conjunctiva should now be examined If it is not affected the presumption is that one is dealing with a case of trachoma If the upper third of the limbus is carefully inspected by means of a loupe, small leashes of blood vessels will be seen running into the layers of the cornea and, at the terminations of these vessels in the cornea small pits will be seen on the surface In most cases of severe conjunctivitis leashes of blood vessels will be found invading the cornea but there will not be in absence of bulbar conjunctivitis or the presence of peripheral pits

In children, where the disease is of short duration cicatrization will not be present in all cases It must be remembered that cicatrization is Nature's attempt at a cure and it does not come early in the disease Reliance must be placed therefore on the other signs I have mentioned Again in children a secondary infection will almost always be found due in the large majority of cases, to rubbing the eyes with dirty hands

Mr A F MacCallan has had almost unrivalled experience of trachoma in Egypt In his book on the subject he states that a case must not be diagnosed as trachoma unless the following signs are present

(1) Trachoma stage 1 Follicles or trachoma stage 2 Follicles on conjunctiva of tarsus or of retrotarsal folds
(2) Cicatrization of conjunctiva on tarsus with or without trichiasis entropion
(3) Pannus follicles at limbus especially at upper third of circumference of the cornea These may be single multiple or ridge like
(4) Peripheral pits especially at the upper third of the circumference of the cornea due to cicatrization of ridge like pannus follicles
(5) Pannus vessels especially at the upper third of circumference of cornea

These signs in my opinion also are pathognomonic of trachoma and I agree with MacCallan that in their absence the case must not be diagnosed as one of trachoma Once more allow me to say "Do not diagnose a case as trachoma simply because he has granular lids"

Treatment

It is written in many textbooks on ophthalmology that trachoma is an incurable disease I do not agree with this, but I say it is a very difficult disease to

in many cases due to the pneumococcus, Morax-Axenfelt diplobacillus and many other organisms. In Egypt it is often due to the gonococcus : but this is rare in this country. In all cases, the secondary infection must be cleared up before a diagnosis of trachoma can be arrived at. There is no doubt that trachomatous lids are more easily infected by a secondary conjunctivitis than by any other condition. Even when the secondary infection is cured, it is often difficult to decide whether the disease is trachoma, follicular conjunctivitis, or simple chronic conjunctivitis. In the case of follicular conjunctivitis, it is, as a rule, easy. Here the follicles are usually in parallel rows and the follicles *sit* on the surface of the conjunctiva and are not like trachoma follicles embedded deep in it. Besides, the lower lid is usually more severely affected than the upper lid, unlike trachoma which is the reverse. It is the simple chronic conjunctivitis case which causes the greatest difficulty. In this condition many cases of granular-looking lids may be found which fact has led many, including myself, to think that they have cured a case of trachoma by a short treatment, whilst all the time the case has been one of simple chronic conjunctivitis. I am afraid it has become a custom with many private practitioners, unskilled in ophthalmic work, to call all these cases trachoma or to use the other name granular conjunctivitis or granular lids. These latter names should be dropped because there are many granular lids which are not trachoma.

In simple chronic conjunctivitis, the bulbar conjunctiva is nearly always affected. There is no drooping of the upper lid ; trachomatous ptosis and the other signs of true trachoma, which I am about to discuss, are absent.

How, then, are we to decide whether trachoma is present or not, taking heed to what I have already said about the other diseases resembling it ? In India, at any rate, I think most cases of trachoma begin in childhood. A visit by motor car to some of the large villages in the Punjab gives ample opportunity of examining the eyes of a very large number of children who invariably turn out to inspect the motor. I shall not be far wrong in saying that at least 50 per cent of these children are suffering from some form of conjunctivitis. Very few of these children ever receive any treatment, except a little boric lotion or something of the sort, so that when we get a recruit for the Indian Army from these children, he will have had trachoma for some considerable time and therefore, if uncomplicated by a secondary infection, the true signs of trachoma will be found.

The first noticeable point about a trachoma case is the drooping eyelids, trachomatous ptosis as it is called. This drooping is more marked in trachoma than in any other form of conjunctivitis. Now evert the lids and palpebral conjunctivitis will be found present in both eyes. No doubt at the very beginning the disease attacks one eye first, but it very soon spreads to the other. I have never seen a case of trachoma in one eye only. The granules and follicles are embedded in the conjunctiva and do not *sit* on the surface as in follicular conjunctivitis. In every case of old-standing *scarring* or *cicatrization* will be found on the under surface of the upper lid. This scarring runs parallel to the

of the lids This softens the conjunctiva and helps to prevent entropion from cicatrization

In old standing cases both sacs are cocainized the lids everted and, with a sharp Volkman's spoon, all the follicles right down to the tarsal plate scraped off I have given up the use of Graddy's forceps and Knapp's roller forceps for this purpose All oozing is stopped, and the raw surface cocainized again and touched with silver nitrate, 60 grains to the ounce In children a general anæsthetic is necessary The conjunctival sacs must be douched out thoroughly with electrolytic chlorine frequently after this has been done The eye must not be bandaged After a week or 10 days, the everted lids are again inspected and if any follicles have been missed, they should be scraped off When healing is taking place the yellow oxide of mercury massage must be carried out in order to prevent entropion

Prevention

When it is remembered that trachoma causes more blindness in the East than any other disease the question of its prevention is one of very great importance It is a lamentable fact that up to the present the cause of trachoma is unknown We know it is a very contagious disease What are we doing to prevent its spread ? In this country at any rate instead of trying to prevent its spread we are promoting it by providing schools in all the towns and villages where children are crowded together without any form of medical examination What better means could we have for promoting its spread ? We have no medical examination of school children attending these village schools and only in the large villages have we got a small dispensary where the eyes of the children can be treated by a medical man who is absolutely unskilled in ophthalmic work

Children with trachoma as I have already said have nearly always got a secondary infection due to rubbing their eyes with dirty hands rags etc I am very strongly of opinion that these weepy muco purulent discharging eyes are the chief cause of the infection A true trachoma by itself is no doubt contagious if the lachrymal secretion comes in contact with another eye either through towels washing vessels or by means of flies but it must be remembered that Indians as a rule do not use a common washing bowl or a common towel They have their own water carrying vessel and their own towel and it is chiefly through dust and flies that the infection may be carried It can thus be realized how the watery muco purulent eye can disseminate the disease especially in schools During the last month I examined the eyes of over 700 Punjabi soldiers and found 12 cases of trachoma Every one of these was an old standing case with a large amount of cicatrization Not a single fresh case was found This shows how little is the danger of infection in these old standing cases when a secondary infection is absent All these men are housed in large airy barracks

In the army, we find that all fresh cases in the troops come from the family lines and the infection is due to the children If, therefore, we are going to deal

cure. When there are a large number of different treatments for the same disease I think I am near the mark in saying they are all wrong, just as when there are a number of theories about the causation of any disease they are all wrong. The treatment I adopt probably comes into the same category, but I claim that it has the effect of greatly ameliorating the disease and preventing serious sequelæ.

In 1912, I published a paper in the *Indian Medical Gazette* on the treatment of trachomatous conditions by injections of cyanide of mercury. There is little doubt that the cases in which I got such improvement of the condition were not trachoma but a simple chronic conjunctivitis. As I have said above, many of these cases present a granular condition of the lids and this is what leads us astray.

If a secondary infection is present, it must be treated first. It is always advisable to take a smear of the discharge and examine it under a microscope to try to discover the causal organism. It is not necessary to cocainize the eye for this treatment. Using an irrigator capable of holding a quart of solution and a rubber tube 6 feet long, and lifting the upper lid on a strabismus hook, douche out the conjunctival sacs with a solution of electrolytic chlorine 1 : 80. (Pure electrolytic chlorine contains about 2·5 per cent of available chlorine and about 20 per cent sodium chloride. It is non-irritative and produces no pain or burning.) Each sac should be douched out with the above solution for at least one minute three times a day. The irrigator should be held at 4 to 5 feet above the eye. On no account should a bandage be applied. In troublesome children, it may be necessary to apply a wire gauze shield to prevent the child from rubbing the eyes.

If this does not cure the condition in 3 days then both conjunctival sacs should be cocainized, the lids everted and the palpebral conjunctiva of both lids brushed with silver nitrate solution, 60 grains to the ounce. After a few hours the electrolytic chlorine treatment should again be begun. This treatment will usually clear up the secondary infection. The eye should be rested from all treatment for about 2 days and then the treatment of the trachoma commenced.

In early cases in children, both conjunctival sacs must be cocainized and the everted lids brushed with silver nitrate solution, 60 grains to the ounce, taking care that the upper fornix is pushed well down by means of a probe or a match stick. The excessive nitrate solution must not be neutralized until the whole surface of the everted lids has turned white. This treatment should be repeated on alternate days for three applications. During this treatment, the sacs should be well douched out with electrolytic chlorine solution three times a day. My chief point is that the silver nitrate treatment should not be overdone.

After giving the silver nitrate treatment a rest for about 5 or 6 days, the under surface of both lids should be carefully inspected and, if necessary, the same treatment renewed for a course of three applications and the sacs douched out as before. Then, again, the everted lids are inspected after 6 days and, if any follicles still remain, they must be scraped off as described below. After the silver nitrate treatment, it is a good plan to apply a little weak yellow oxide of mercury ointment, 4 grains to the ounce, and massage it well into the under surface

Khas, Suret, Bulsar, Bombay, etc it engages touring eye surgeons who keep a register of patients suffering from eye diseases in every village they go round the villages, treat the cases and bring such cases as require operation to head quarters and operate Any gentleman wanting literature on the subject will be supplied with it by me with great pleasure

Dr F Maja Das (United Provinces) Trachoma is due to three factors —

(1) Irritation, heat, glare, dust, (2) Infection and (3) Deficiency —In my experience it occurs more amongst urban communities e g Banias and Brahmins in Kathiawar, usually showing some other signs of deficiency When it occurs in perfectly healthy individuals, there is a rapid response to ordinary treatment

Major F E Strother Smith, I M S (Punjab) replied I agree with Major Kirwan that unless there is a secondary infection present, the danger of infection is very small or absent I examined a regiment a few days ago and found 12 cases of trachoma without secondary infections and not a single fresh case was found. This shows that the danger of infection is very small when men are housed in large airy barracks.

effectively with trachoma we must begin with the children, especially in the towns and villages. We must either organize a number of travelling eye dispensaries or establish a school medical service. In Egypt, Macallan established the former with excellent results and there is no reason why the same should not be done in India. But before we establish either, we must have a staff fully trained in tropical ophthalmology for the purpose. At the present time we have not got it.

We have here in Calcutta one of the finest schools of tropical medicine in the world and we are all proud of it. Here, valuable research work is being carried out in tropical diseases. What is being done in the way of research into tropical eye diseases ? When it is realized that there are over 2 million blind in India, is it too much to suggest that some research work should be done to try to prevent it by discovering the causes of some of the eye diseases which are the chief cause of this blindness ?

DISCUSSION.

Lieut.-Col. W. V. Coppinger, I.M.S. (Bengal) : stated that it was his experience in Calcutta and also the experience of Bombay and Madras that nine-tenths of the cases sent to the eye hospitals diagnosed as trachoma were not trachoma at all. With ordinary antiseptic and astringent treatment these cases of conjunctivitis cleared up, showing they were only due to irritation. It was the experience in the segregation camps for trachoma in France during the Great War that these eye conditions cleared up with simple astringent treatment, such as zinc and boric drops.

Major E. O'G. Kirwan, I.M.S. (Bengal) : I consider that trachoma is largely a deficiency disease, the patient's diet is lacking in some vitamine and the conjunctivitis is a secondary infection due to the Koch-Weeks, Morax-Axenfelt bacilli, pneumococci, etc. Trachoma clears up much quicker on treatment in well-nourished people.

Dr. A. Hamilton Harnie (Punjab) : It would seem to require some explanation that deficiency of vitamines should explain the cause of the disease in the region in which trachoma is found most frequently in India, viz., the Punjab.

Dr. B. N. Bhaduri (Bengal) : Since the question of vitamine-deficiency has been raised, I would like to mention my experience. The fishmongers of Calcutta, who live in a limited area, live on a diet sufficiently rich in vitamine : fish, rice, dal and other substances, and vegetables, and are more susceptible to trachoma than their neighbours who are under-nourished to a greater extent. I would not advocate such heroic use of silver salts in treatment for fairly obvious reasons.

Dr. B. C. Vachharajani (Bombay) : I would like to differ from the gentleman who has just spoken and state that silver nitrate, 60 grains to the ounce, is a very good remedy for trachoma. I treat my cases myself by first giving them a wash, then scraping them with a cataract knife, and after cocaine applying silver nitrate, 60 grains to the ounce, every alternate day and in a fortnight the cases are cured. Major Strother Smith says that there are no organized methods of eye relief work in India, I would like to inform him that in the Bombay Presidency we have a Blind Relief Association which has seven branches, at Bijapur, Chalisgaom, Mirpur

Two hundred and forty-four deaths occurred directly due to pregnancy and labour from causes as follows:—

Anæmia of pregnancy	87 cases	35 65	per cent
Puerperal sepsis	43 ,,	17 62	,,
Eclampsia	25 ,,	10 24	,,
Osteomalacia (its consequences) .. .	22 ,,	9 01	,,
Hæmorrhage	29 ,,	11 88	,,
Other complications of pregnancy and labour	38 ,,	15 57	

When these figures are compared with similar sets of figures from other countries, it appears in a general way that in India accidents and complications of labour are fewer, but the diseases of pregnancy are much more frequent

THE PRINCIPAL DISEASES OF PREGNANCY.

(a) Anæmia

In a general way this disease resembles Addison's pernicious anæmia, but differs from it in its more sudden onset, its more rapid course and its lack of remissions.

It occurs in every part of India, but it is still uncertain if it occurs or at least originates in hill stations. In a series of 150 cases personally followed up in Bombay city, the clinical symptoms and blood-picture closely resembled those of the hæmolytic anæmia of pregnancy reported from other countries

The symptoms usually commenced at or after the middle of pregnancy. Fever was often an initial symptom followed by œdema swelling pallor and weakness. In 38 per cent of the cases diarrhœa occurred in 10 per cent vomiting in 31 per cent sore tongue. Twenty-nine per cent were primiparæ and the majority of cases occurred during the second half of the year Recovery never took place until after delivery, which was usually premature Death occurred in 12 per cent of the cases, most often within 24 hours of delivery, but sometimes delayed many weeks. Delivery, while sometimes leading to rapid recovery, seemed in other cases to have an adverse effect. Fifty-three per cent of infants were stillborn and another 15 per cent died a day or two after birth None showed signs of anæmia. Women of all communities were affected, but the proportion of Mahommedan women was greatest.

It occurred in better class women rather than in the very poor. A number of cases have been followed up after discharge from hospital, and it is found that recovery is usually complete after six months In some cases normal pregnancy has followed.

In the blood-picture, the red cells were much reduced frequently to below 1 million per c.mm., hæmoglobin was reduced to a lesser extent and the colour index was high. There was rarely leucopenia. Blood platelets were scanty or absent. Anisocytosis was almost always present, poikilocytosis frequently so, nucleated

GYNÆCOLOGY AND DISEASES OF PREGNANCY.

DISEASES OF PREGNANCY AND LABOUR IN INDIA, WITH SPECIAL REFERENCE TO COMMUNITY.

BY

MARGARET I. BALFOUR, C.B.E., M.B.,
Haffkine Institute, Bombay.

TUESDAY, DEC. 6TH, 2 TO 4 P.M.

THERE has in the past been little opportunity for Indian research in matters connected with pregnancy, partly owing to the popular prejudice which has excluded medical men from the lying-in-room. During the last 60 years, western medical science has been accepted more or less eagerly by the people in all departments of surgery and medicine, but it is only of very recent years that women have begun to feel confidence in western methods of treatment for childbirth. Even now it is principally in the large towns of the three Presidencies that they attend the Government maternity hospitals. In other parts of the country, hospitals officered by women doctors and nurses are multiplying and during the last 10 or 15 years there has been a great increase in the cases of labour admitted to their wards.

The immense majority of cases of childbirth in India are delivered by *dais*, that is indigenous midwives who are untrained, quite illiterate and usually very unwilling to adopt new methods or accept opportunities for training offered. This leads to neglect, delay, unnecessary suffering and mortality. Many well-trained midwives are being turned out by the hospitals, but owing to the lack of registration and any legal enactments regulating the practice of midwives, their work in general practice tends to deteriorate.

An enquiry on maternal mortality in childbirth has been carried out during the past two years under the auspices of the Indian Research Fund Association. Records of 11,343 cases of labour have been sent up from hospitals in different parts of India by qualified medical men and women. These have been examined and classified.

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the normal destruction of blood in the tissues continues, and in a longer or shorter time death ensues

It is very important however, that we should get more evidence as to post mortem conditions, and I hope that all practitioners who meet with these cases will endeavour to secure an examination after death and especially of the bone marrow The tibia is easily removed, and a piece of wood can be inserted to prevent distortion of the limb The bone should be sawed up longitudinally and examined by the naked eye and if possible under the microscope

Bacterial organisms were commonly found in the urine These differed in different cases and were not found to agglutinate the patients blood It was concluded they were the result, not the cause of the condition

The fæces were examined in a number of cases to ascertain if there were any excess of *B welchii* or any increase in its toxicity The results of this investigation are given in detail by Dr Emanuelov and Dr M M Mehta in their paper which follows I need therefore only say that toxins prepared from *B welchii* in the fæces of some of our anæmia cases have produced anæmia in pregnant guinea pigs and still birth and neonatal deaths in their young These experiments will be repeated shortly on a larger scale

Malarial parasites (usually *p falciformis*) were found in 8 per cent of the cases Hookworm ova were found in five cases, in which the anæmia was not very severe Hookworm is uncommon in Bombay

Facts in favour of the disease being a toxæmia due to pregnancy are the following* —

(1) Recovery does not take place before delivery
(2) When recovery takes place after delivery, it is complete
(3) The condition in most cases does not recur in following pregnancies
(4) It is more common in primiparæ
(5) It resembles one toxæmia (hyperemesis) in the frequency with which vomiting occurs and it resembles another (eclampsia) in the frequent occurrence of albuminuria and œdema
(6) The child is never anæmic but is frequently wasted as in eclampsia

(b) *Eclampsia*

The incidence of eclampsia in India is probably about the same as in England, but owing to the prevalence of other diseases of pregnancy it takes a smaller share in the mortality Its incidence appears to vary in different parts of the country. Thus if we take the capital cities of the three Presidencies for the year 1925 26, in Bombay out of 2 571 cases of labour seen by myself there were 25 cases of eclampsia In Madras as shown by the annual report of the Government Maternity

* Since this paper was written I have been treating cases of anæmia of pregnancy with liver extract and in some cases with cooked liver An immediate and rapid improvement has taken place and this leads to the belief that the cause of the disease is related to a liver deficiency

red blood cells were present in about half the cases though not in large numbers and normoblasts were more frequent than megaloblasts. Post-mortem examinations were rarely possible, but were obtained in two cases when evidence of hæmolysis was found in the liver and spleen and some aplastic areas were seen in the bone-marrow.

I should perhaps say something as to the meaning of the blood-picture.

In examining the blood we are not only trying to gauge the condition of the patient, but we are trying to get evidence as to the cause of the anæmia. There are two main varieties of anæmia :—

(1) Aplastic, in which some toxin has poisoned and paralyzed the bone-marrow, so that it ceases to form new blood elements and becomes transformed into a pale gelatinous mass.

(2) Hyperplastic, in which some toxin is destroying blood cells in the tissues. The bone-marrow becomes abnormally active and throws into the circulation a number of immature red cells containing nuclei and known as normoblasts and megaloblasts. The bone-marrow takes on a deep red velvety appearance. This is the condition usually found in Addison's pernicious anæmia.

The blood elements which are formed in the bone-marrow are the red cells, the blood-platelets and the polymorphonuclear leucocytes. These are all diminished in anæmia of pregnancy which is our first indication pointing towards the condition of aplastic anæmia.

Nucleated red cells are not common. In our Bombay cases they were absent in 50 per cent and when present they were not in large numbers. In fact, there was not much evidence of blood regeneration.

When much blood destruction is taking place in the tissues, there is much hæmosiderin which is a product of disintegrated hæmoglobin. The presence of an abnormal amount of hæmosiderin is estimated by Van den Bergh's chemical reaction. We have done Van den Bergh's test in a number of our cases and do not usually find a high reaction, that is, we do not find much evidence of blood destruction in the tissues.

We have had two post-mortems and in both cases took out the tibia and examined the marrow. In both cases there were aplastic areas and no evidence of hyperplasia. At the same time we examined the liver and spleen with ferrocyanide of potassium and got a good Prussian-blue reaction. This proves that some amount of blood destruction was going on at least in the liver and spleen.

The conclusion we come to, therefore, on the evidence we have, is that the anæmia is largely aplastic, that is, some toxin is poisoning the bone-marrow and to a less extent destroying the red blood cells in the tissues. This would explain why so many cases recover slowly after delivery and why some die weeks and even months later. The bone-marrow has been so severely injured that it cannot revive,

My information has been gained —

(1) By means of a questionnaire sent to a number of all India maternity wards

(2) A similar questionnaire sent to maternity hospitals in Bombay city

(3) Notes personally taken in Bombay hospitals

The result has been tabulated

TABLE I

Incidence of Osteomalacia, Eclampsia and Anaemia by community in all-India hospitals

Community	Osteomalacia			Eclampsia		Anaemia	
	Number of cases	Number of cases	Ratio per 1,000 labour cases	Number of cases	Ratio per 1,000 labour cases	Number of cases	Ratio per 1,000 labour cases
Hindu	5,167	160	30.9	79	1[illegible]2	148	[illegible]
Mahommedan	1,[illegible]	[illegible]	6[illegible]0	31	[illegible]	40	331
'Other' (mainly Indian Christian)	1,152	6	5.2	8	6[illegible]	1[illegible]	130

Table I shows the ratio of osteomalacia, eclampsia and anaemia of pregnancy in 7,592 cases in all India wards. The class 'other' is almost entirely composed of Christians. It will be seen that the ratio of all diseases is highest in Mahommedans, and least in 'other class'.

TABLE II

Incidence of Osteomalacia, Eclampsia and Anaemia by community in Bombay city hospitals

Community	Osteomalacia			Eclampsia		Anaemia	
	Number of cases	Number of cases	Ratio per 1,000 labour cases	Number of cases	Ratio per 1,000 labour cases	Number of cases	Ratio per 1,000 labour cases
Hindu	2,008	6	[illegible]	[illegible]	3[illegible]	[illegible]	[illegible]
Mahommedan	812	32	[illegible]	1[illegible]	16[illegible]	29	3[illegible]
'Other' (mainly Indian Christian)	801	[illegible]	[illegible]	3	3.7	[illegible]	[illegible]

Hospital there were 39 cases of eclampsia among 2,923 cases of labour. In the Eden Hospital, Calcutta, there were 64 cases of eclampsia among 1,329 cases of labour,* that is, the rate per 1,000 labour cases was 41 in Calcutta as compared with 13·3 in Madras and 9·7 in Bombay. The case mortality was 31·2 per cent in Calcutta, 12·8 per cent in Madras and 12·0 per cent in Bombay.

(c) *Osteomalacia.*

This is a disease of early adult life, especially associated with pregnancy, in which the bones undergo softening leading frequently to extreme degrees of pelvic deformity. It is believed to be identical with rickets but occurs later in life. Recent research indicates that it is due to a diet deficient in vitamin D, to lack of sunlight or lack of exercise. It occurs most often in the northern and central parts of India, is less common in the west and altogether absent from the south. It is easy to understand its greater frequency in the north, where the purdah system is prevalent and women lead very secluded lives. Moreover, the colder winter leads to closer confinement indoors. But it is difficult to explain why it should be unknown or very rare in the south where gosha is observed among certain classes of women. Why should Bombay suffer and Madras escape?

Moreover, all who have seen much of the disease will remember cases where the woman was accustomed to a good diet and plenty of sunlight. A case occurred recently in a woman dock labourer who had abundant exercise. Anæmia is not infrequently associated with osteomalacia.

The following comparative facts regarding the three diseases are interesting.

	Osteomalacia, 75 cases.	Anæmia, 144 cases.	Eclampsia, 42 cases.
Average age	25·3	25·2	21·0
Youngest age	17	16	14
Number below 20 ..	10·6 per cent	13·6 per cent	45·2 per cent
Primiparæ	14·4 „	29·0 „	71·8 „

Effect of religion or community on the incidence of the above diseases.

In India, speaking in a broad sense, we have three communities of women living side by side, subject to the same climatic and housing conditions, equally exposed to endemic and epidemic diseases, but differing as regards certain important particulars, namely, literacy, domestic habits, etc. These communities are the Hindu, Mahommedan and Christian. To these may be added a fourth—women industrial workers.

* From information kindly supplied by the Superintendent.

12 3 per cent, in the Mahommedan community 10 3 per cent and in the Indian Christian community 2 per cent only

TABLE IV

Labour cases, not exclusively primiparæ in Bombay hospitals

Community	Number of cases	Still births per cent	Disease per cent	Infant birth weight (lbs)	Per cent Infants below 6 lbs.
Hindu	900	10 8	3 3	6 1	[illegible]
Mahommedan	512	15 1	11 1	6 3	27 4
Christian	457	7 8	2 0	6 1	17 3
Mill hands	138	16 6	2 1	5 3	63 8
TOTAL	2 007	11 2	5 7	6 2	[illegible]

Table IV shows similar facts relating to 2 007 cases in Bombay hospitals not exclusively primiparæ

The column of birth weights includes only full time and apparently healthy infants All the communities contain a number of fine and healthy babies but they also include a varying number of babies below par as shown in the last column of Table IV It is such babies no doubt together with the prematurely born, which lead to the high infant mortality rate during the first month of life The incidence of prematurity is not shown in the tables but the 2 007 labour cases *included 112 premature babies most of whom died before leaving hospital*

EFFECT OF ADVERSE CUSTOMS

The customs in the different communities which are likely to affect pregnancy prejudicially are —

(1) *Purdah* —Purdah women live in rooms often small and more or less devoid of light and air They never escape from these surroundings unless they go out in a carriage or burkha for exceptional reasons The only occupation is housework, which is simple and does not require much exertion It is probably the lack of all exercise rather than the actual confinement which is prejudicial

(2) Many Indian women not actually in purdah lead very sedentary lives Exercise is not taken for the sake of exercise

(3) *Diet* —Speaking in a general way Mahommedan women eat meat frequently, cooked with ghi together with bread and vegetables Hindus even when not vegetarians, eat less meat and have it less frequently The figures

Table II shows the same ratio for the Bombay city cases. I place most reliance on the Bombay figures, as Bombay is the head-quarters of my work and I was able to collect definite information showing :—

(1) that my figures represent about one-sixth of the total births of Bombay city for 1926 as kindly supplied by the Executive Health Officer, about 44 per cent of the Christian births, about 23 per cent of the Mahommedan birth and about 14 per cent of the Hindu births;

(2) that purdah is usual among Mahommedan women in Bombay, but is not observed at all among Hindu women ;

(3) that diet is more abundant, or at least richer in proteins and fats among Mahommedan women in Bombay than among Hindu women.

(4) that literacy is more advanced among Christians in Bombay than among Hindus and Mahommedans, the figures for the 1921 census being 553 per 1,000 for Christians, 185 per 1,000 for Hindus and 183 per 1,000 for Mahommedans ;

Table I is put up to show that there is a general resemblance in the figures, although owing to the fact that they are drawn from areas widely apart, details as to habits and customs are not available.

TABLE III.

Primiparæ in Bombay city hospitals.

Community.	Number of cases.	Average age.	Still-births per cent.	Disease per cent.	Average infant birth-weight, (lbs.)
Hindu	·362	19·9	11·8	3·0	5·9
Mahommedan ..	174	19·4	17·2	10·9	6·2
Christian	189	22·0	6·8	2·1	6·2
Below 17 years ..	75	15·6	20·0	9·3	5·9
TOTAL ..	800	18·7	12·6	5·1	6·1

Table III shows certain facts regarding primiparæ of different communities in the Bombay hospitals. The cases entered in the column for diseases are diseases specially connected with pregnancy, such as eclampsia, osteomalacia and anæmia of pregnancy. Such diseases as dysentery or malaria have not been included. An interesting feature is the average age of the mothers. It was a surprise to myself to find the average so high as 18·7. Among the 847 primiparæ, 75 or 8·8 per cent were below 17 years of age, that is, 57 were 16, 11 were 15, and 7 were 14 years of age. In the Hindu community, the proportion below 17 was

Christian women, free from purdah, leading more active lives, with a later marriage age, more literacy and knowledge of hygiene, have the smallest disease and still birth rate

As regards the infant birth rate, the difference is not great in the three communities but the Christian community has a *decidedly smaller* proportion of babies born below par

The mill hands who work eight or nine hours daily in the cotton factories, usually standing all the time and who often in addition do the cooking and domestic work for their families, have the smallest disease rate Their diet is often sparse for, although the wages of husband and wife make a fairly good income the husband is apt to spend his on drink and the wife's wages have to support the family She is generally unable to continue work after the seventh or eighth month so that existence is even more difficult for her during the last 2 months She has a high still birth rate and a very low infant birth weight The majority of the babies are below par

The primipara below 17 have a high disease rate and a high still birth rate

The customs enumerated are of course only predisposing causes of the diseases of pregnancy It will be long before they can be completely eliminated from India therefore it behoves us to find out the actual causes

Far more careful medical research ought to be carried out in connection with prenatal conditions both for the relief of maternal and infant mortality

I should like to point out that although India ought to be an ideal field for obstetric research, possible workers are hindered by the difficulty in getting facts of importance from the statistics kept in most maternity hospitals Hospital officials naturally keep their statistics to meet the requirements of the Government reports All that is required by the Government of Bombay from maternity hospitals is —

I		II	
Number of Normal Labour cases	Number of Deaths	Number of Abnormal Labour cases	Number of Deaths

Some Local Governments do not even require so much The causes of the deaths are not asked A list of obstetric operations has to be filled up but the disease which required the operation need not be entered For instance the fact is recorded that forceps were applied so many times but no indication is given if it was on account of a contracted pelvis, placenta previa, ... child maternal inertia etc The particulars are not required for the report therefore they are often not entered on the case sheets and hospital records, which might be a mine of information, are of very little use in research

for vegetarian and non-vegetarian Hindus were at first kept apart, but it was found there was no difference in the figures of the two classes. As a matter of fact many of those who describe themselves as meat-eating Hindus take very little meat. It is too expensive for the very poor.

Christians usually have a good mixed diet, the exception being the Goanese community in Bombay. In Goa, they have an abundant diet of fish and rice. In Bombay, they find fish expensive, so eat rice alone or with a little vegetable. The poorer class in all communities have a tendency to substitute vegetable oil for ghi in their cooking as being cheaper. Ghi is used for cooking meat, hence meat-eaters have a better supply of ghi.

(4) *Early marriage.*—The figures given in the tables relate to the birth of the first child. Enquiry was made as to the age at which cohabitation had begun in all cases of still birth. In 116 consecutive cases (Hindu, Mahommedan and Christian) 58 or 50 per cent had commenced cohabitation before the age of 16. The youngest age was 12. As shown in Table III, the pregnancy following this early cohabitation is often unfavourable both to mother and child.

(5) *Consanguineous marriages.*—Marriage between first cousins is frequent among Mahommedans and is sometimes continued in the same family for several generations. Hindus do not marry outside their caste, but there are strict rules forbidding marriage within caste groups, that is, descendants of a common ancestor. The wife becomes a member of her husband's group, hence her children may intermarry with her relations, but this is often prevented by rules forbidding marriage within a certain number of degrees of relationship on both sides of the house.

(6) *Literacy.*—This is more advanced in the Christian than in the other communities. Moreover, literacy is a loose term. With Hindu and Mahommedan women it too often means only a year or two at a primary school. With Christian women it often means six or eight years at a mission school where the girls are trained in hygiene and physical exercises as well as in book-work. Such a girl in after life will be healthier, wiser as regards food and more ready to seek advice in illness. The Hindu women delivered at Bombay hospitals represented 14 per cent of the total Hindu births for the city, while the Christian women so delivered represented 44 per cent of the total Christian births.

Summary.

To sum up, Mahommedan women who observe purdah, who have a fairly rich protein diet, who often intermarry with relatives and who marry about the same age as Hindu women, have a very high disease rate in pregnancy and in consequence a high still-birth rate.

Hindu women, free from purdah (in Bombay) with a more sparse diet and the same habit of early marriage, have a much lower disease rate and a lower still-birth rate.

A PRELIMINARY NOTE ON THE BACTERIOLOGICAL EXAMINATION OF SOME DISCHARGES AND EXCRETA FROM CASES OF ANAEMIA OF PREGNANCY, NORMAL PREGNANCY AND OF NON PREGNANT CASES OF ANAEMIA

BY

ALEXANDRA EMANUELOV, M D

AND

MANECK M MEHTA, M A, Ph D, D Sc

This paper gives an account of the principal pathogenic species of *B welchii* and streptococci isolated from faeces and urine in the above conditions

1 Their method of separation
2 Cultural reactions
3 Preparation of toxin
4 Animal reactions (toxicity and influence on elements of blood)
5 Conclusions

While working on anaemia of pregnancy we thought that it might be possible that the same cause which produces Addison's pernicious anaemia might also produce many minor degrees of anaemia which are responsible for the high rate of maternal and infant mortality among all classes of women in Bombay. After eliminating causes known to produce anaemia in India namely malaria, dysentery, hookworm and sprue, investigations were carried out on some discharges and excreta from cases of anaemia of pregnancy to find out if it could be due to some haemolytic streptococcus or some variety of *B welchii* as has been proved by some other workers [e g, Bull and Pritchett(1)]. The primary cultures of *B welchii* and supernatant fluid are haemolytic when injected directly into the circulation of rabbits and pigeons and the rapid death produced may be ascribed to a massive destruction of red corpuscles. It has been noted that the passage of the fluid portion of a glucose broth culture through Berkefeld filters reduces materially their haemolytic and poisonous effect. Patterson and Kast(2) describe changes brought about in monkey blood when injected with *B welchii* toxin which were strongly suggestive of pernicious anaemia. Similarly Reed and Orr(3) describe blood changes in rabbits resembling those in pernicious anaemia following *B welchii* injections, and Kahn and Torrey(4) give an account of the possible relationship between absorption of *B welchii* toxin and pernicious anaemia.

It would greatly advance our knowledge regarding pregnancy in India, if Government would require information under certain headings and would require the larger Government maternity hospitals to publish clinical reports compiled by a competent medical officer on the lines of that published by the Madras Maternity Hospital and hospitals in other countries. It would also be of great assistance if medical officers of health in large towns would institute headings for osteomalacia (as a contributory cause) and anæmia of pregnancy in their tables of deaths. In the largest towns at least, the number of deaths reported by medical practitioners and hospitals is enough to give very useful information.

Carbinol and indol reactions were always negative they all liquefied gelatine they were gram positive and non motile Spores were formed in alkaline medium after 48 hours

Hæmolytic Test—There were considerable differences among the strains of *B welchii* in regard to their hæmolytic capacity some being strongly hæmolytic some slightly hæmolytic and some non hæmolytic Their hæmolytic power was tested in ordinary saline solution mixed with defibrinated erythrocytes (10 c cs of 0 85 per cent saline and 5 drops of erythrocytes 2 5 per cent) About 0 3 c c of liquid culture was inoculated in this saline tube and incubated at 37°C overnight and examined for hæmolysis on the following morning Milk culture glucose broth culture and ordinary broth culture showed the same degree of hæmolysis when tried with the same strain When subcultured repeatedly they seem to lose their hæmolytic power The hæmolytic test was also done with blood agar (100 c cs of ordinary agar mixed with 5 c cs of defibrinated blood) but the results were not satisfactory as the growth was very slow and it was not possible to judge the degree to which it was hæmolysed as it was in blood saline When the hæmolysis was complete it was represented by ++++ and in doubtful cases by ±

TABLE II

B welchii *Hæmolytic power*

Anæmical cases 45							Normal controls 31						
Absent	—	±	+	++	+++	++++	Absent	—	±	+	++	+++	++++
3	5	4	8	6	7	4	3	4	3	3	7	2	5
In 8 cases hæmolytic power not tested							In 4 cases hæmolytic power not tested						

We observed that when a strain fermented a greater number of sugars it was more hæmolytic than when it fermented a fewer number of sugars

Preparation of Toxin *B welchii* toxin was prepared by growing the organism in ordinary or glucose broth for 18 to 20 hours at 37°C The material was then passed through Chamberland filters and used directly The toxicity of the fluid portion of the broth cultures was investigated by centrifuging The supernatant liquid was tried on animals after centrifuging the deposit for five minutes All these strains were selected from pregnant and non pregnant anæmic cases Their hæmolytic power varying from ++++ to +++

EXPERIMENTS

Our object in making the following experiments was to find a constantly good and reliable strain of *B welchii*, to test the virulence of the cultures, and

Since the middle of May, 76 samples of fæces from cases of anæmia of pregnancy, normal pregnancy and from non-pregnant cases of anæmia were examined for *B. welchii* in the following manner.

METHOD OF ISOLATION AND CULTURAL CHARACTERISTICS.

Ordinary sterilized milk tubes were heated in boiling water for ten minutes, a loop full of fæces was sown in each of these tubes and heated again in boiling water exactly 60 seconds, the tubes were then removed from boiling water and sealed immediately with boiling vaseline and incubated at 37°C. If *B. welchii* was present, acid clot with evolution of much gas was seen within 18 to 48 hours.

TABLE I.

B. welchii. 76 *Cases.*

Cases.		Absent.	Present.
Cases of Anæmia ..	.. 15	3	12
Normal Controls ..	.. 31	3	28
TOTAL	.. 76	6	70

When examined microscopically, they were large bacilli with square ends sometimes occurring in pairs. When subcultured ærobically, except in some few cases, they gave no growth. They gave good growth in ordinary broth, glucose broth and in meat medium under anærobic conditions.

Cultural Reactions.—According to their fermentative power, six varieties of *B. welchii* were separated. Their sugar reactions are shown in the following table :—

Type Number	Litmus milk.	Lactose.	Glucose.	Dulcite.	Mannite	Maltose.	Saccharose.	Laevulose.	Galactose.	Raffinose.	Arabinose.	Dextrine.	Salicine.	Inuline.	Hæmolysis.
38	ACD	A—	A—	——	-	A—	A—	A—	A	——	A—	A—	——	A—	++
42	ACGD	AG	AG	——	——	AG	AG	AG	AG	AG	AG	AG	——	——	++
46	AC	A—	A—	——	——	A—	A—	A	A—	——	A—	AG	——	——	++
106	AGCD	AG	AG	A—	A—	AG	AG	A—	AG	AG	AG	AG	——	AG	++++
69	AGCD	AG	A—	——	—	A—	A—	A--	AG	——	——	——	——	AG	+
85	AGCD	A—	A—	——	——	AG	A—	A—	A—	——	——	——	——	——	—

A = Acid, C = Clot, G = Gas, D = Decolorized.
AG = Acid and Gas, A — = Acid without Gas, —— Neither Acid nor Gas.

Guinea-Pregn

Guinea-Non

Guinea-Non

Guinea Non

Guinea Non

Guinea Non-

Guinea-Preg

Showing details o

Animals	Date	Weight in ounces	Material inoculated Intravenous	
Rabbit No 34 Non-pregnant.	13-9	..	2 c cs. *B. welchii* toxin No 106	•
	20-9	..		
	21-9	..		1,5
	26-9	..	2 c cs *B. welchii* toxin No 106	•
	1-10	..		•
Rabbit No. 35 Non pregnant.	26-9	..	2 c cs. *B. welchii* toxin No 98.	•
	1-10	..		
Rabbit No. 36 Non pregnant.	13-10	88	Before inoculation ..	3
	14-10	..	After two hours. 5 c cs *supernatant liquid of* broth culture *B welchii* No. 150	
	20-10	84		6,

of the toxins prepared from the cultures, by injecting them into rabbits and guinea-pigs.

(1) Five guinea-pigs were injected with 1 c.c., 2·5 c.cs. of *B. welchii* culture, two with milk culture, two with broth culture and one with meat culture, subcutaneously or intraperitoneally. One of these was pregnant. All five guinea-pigs survived; the blood pictures remaining practically the same. The pregnant one gave birth to two young ones, both of which died within a fortnight.

Small incisions were made on two guinea-pigs which were infected with cultures of *B. welchii*. No gas gangrene was formed. There was slight inflammation after 24 hours which subsided gradually. One of these guinea-pigs was pregnant, it gave birth to two young ones, one of which died immediately. (*See* Table III.)

(2) One non-pregnant rabbit was injected intravenously with 2 c.cs. of toxin filtrate, another rabbit with the same and repeated doses of 2 c.cs., and a third rabbit was injected intravenously with 5 c.cs. of the supernatant liquid of a centrifuged broth culture. In all three cases there was no change in the blood-picture, and all the animals survived. (*See* Table IV.)

(3) Ten guinea-pigs were inoculated with the toxin filtrates of different strains, intraperitoneally or subcutaneously. Seven of these were given one dose each, varying from 0·2 to 0·5 c.cs. Five of these guinea-pigs were non-pregnant and two pregnant. In every case there was slight swelling observed at the inoculated area within 24 hours, otherwise the animal looked healthy. There was very slight change in the blood-picture and in the count, except in one case where there was a gradual fall in the number of erythrocytes till the tenth day. The leucocyte count invariably fell gradually. The hæmoglobin percentage remained almost the same. In three cases, the blood began to clot very rapidly on fourth day and it was not possible to do the total count. Of the two pregnant guinea-pigs, one gave birth to three still-born young ones three weeks after injection and the animal died seven weeks after injection. A post-mortem was done. The results will be given later on. The other gave birth to two young ones, both of which died within three days, the animal survived and looks healthy.

Of the five non-pregnant, one died after two months. A post-mortem was done; the rest survived and look healthy. (*See* Table V.)

(4) Three healthy pregnant guinea-pigs were injected with repeated doses of toxin, the dose varying from 0·2 to 1·0 c.c. subcutaneously. In these cases, the blood-picture slightly resembled that of pernicious anæmia; in one of these cases normoblasts were also seen, this guinea-pig died on the 26th day after injection before delivery (4 young ones *in utero*); the second guinea-pig gave birth to four still-born young ones after 20 days, the animal survived; the third gave birth to three young ones after 22 days, two of which died immediately and one after one day. The animal died after five weeks. A post-mortem was done. (*See* Table VI.)

B. welchii *toxin*.

Anti-...	Delivery.	Results	Post mortem.	Prussian-blue test.	Remarks.
.	.	.	Very thin, hairs fallen off Complete absence of fat Heart enlarged Fluid in pericardium. Gall-bladder enlarged, liver hyperæmia spleen normal, kidney and suprarenals enlarged.	Strong reaction with liver and spleen. Faint with kidneys.	....
.	..	..		..	....
...cyt 3	.	.		..	....
...nea p... Non pre... cyt 5	..	..		..	....

Guinea-pig No. 25 Pregnant.	3-9	26	0·2 *B. welchii* toxin No. III.	20
	5-9	26		
	7-9	..	...	40
	19-9	..	....	46
		..	0·2 *B. welchii* toxin No. III.	P o...
	27-9	..	....	21

Table IV.

nation in animals inoculated with B. welchii *toxin.*

of Blood.		Differential Count. Per cent.											
Hæmoglobin, per cent.	Colour Index.	Polymorph.	Lymphocytes.	Mononuclears.	Eosinophilia.	L. mono. and Trans.	Polychromatophilia.	Achromia.	Anisocytosis.	Poikilocytosis.	Pathol. Leucocytes.	Normoblasts.	Resu
73	..	42	52	2	4	..	+	..	+	..	....	..	..
70	..	45	50	1	4	..	++	..	++	..	....	..	..
62	0·7	20	80	..	..	..	++	..	++	..	....	..	..
62	..	24	66	4	2	2	++	..	++	..	Myelocyt. 4–100	..	..
65	..	27	69	2	..	2	+	..	++	+	Myelocyt. + 1	..	Alive.
73	..	6	91	2	1	..	+	..	+	..	....	..	..
71	..	10	86	2	2	..	+	..	+	..	Myelocyt. + 1 LK=3–100	..	Alive.
72	1·0	24	71	..	..	2	..	..	..	..	LK=2–100	..	...
72	1·0	..	..	..	..	..	..	..	..	..	....	..	...
No change.													
72	0·57	3	97	..	..	..	..	..	..	..	....	+1	Alive.

2. Cultures of *B. welchii* were found not to be pathogenic for animals when injected subcutaneously, intraperitoneally or inoculated through small incisions of the skin.

3. Such cultures were pathogenic to the *unborn young* of whom all but one died within a fortnight of birth.

4. Toxins obtained from the same strains by filtering or by centrifuging for five minutes did not produce an immediate effect, but in some cases, especially when repeated doses were given, led to chronic anæmia and death.

5. Post-mortem examinations showed the typical picture of *B. welchii* infection.

6. In all cases where pregnant guinea-pigs were inoculated, the young were still-born or died within three days of delivery.

7. In the examination of the urine, bacterial organisms were found in 79·5 per cent of the cases of anæmia as compared with 8·4 per cent in a series of normal controls. Thirty-three per cent of the organisms recovered from cases of anæmia were streptococci, but these were seldom hæmolytic.

ACKNOWLEDGMENTS.

We are deeply indebted to Dr. Margaret Balfour and Lieut.-Col. F. P. Mackie, I.M.S., Director, Haffkine Institute, Parel, Bombay, for their kind advice while carrying out the above researches.

REFERENCES.

(1) BULL and PRITCHETT (1917) .. *Jour. Exper. Med.*, Vol. XXVI, July, p. 119, and October, p. 603.
(2) PATTERSON and KAST (1925) .. *Proc. Soc. Exper. Biol. and Med.*, Vol. XXIII, p. 171.
(3) REED and ORR (1926) .. .. *Canadian Med. Assoc. Jour.*, Vol. XVI, p. 525.
(4) KAHN and TORREY (1927) .. *Proc. Soc. Exper. Biol. and Med.*, Vol. XXIV, p. 5 and p. 413.

OSTEOMALACIA IN INDIA

BY

A C SCOTT, W M S,
Director, Women's Medical Service Delhi

My only excuse for offering a paper on such a big question as Osteomalacia in India' is that 12 years ago I spent 6 months on an enquiry into this subject Six weeks of this time I spent touring in north India when I visited and personally examined 83 cases of osteomalacia in the following towns —Amritsar Lahore, Ferozepore, Delhi Agra and Burhampur C P

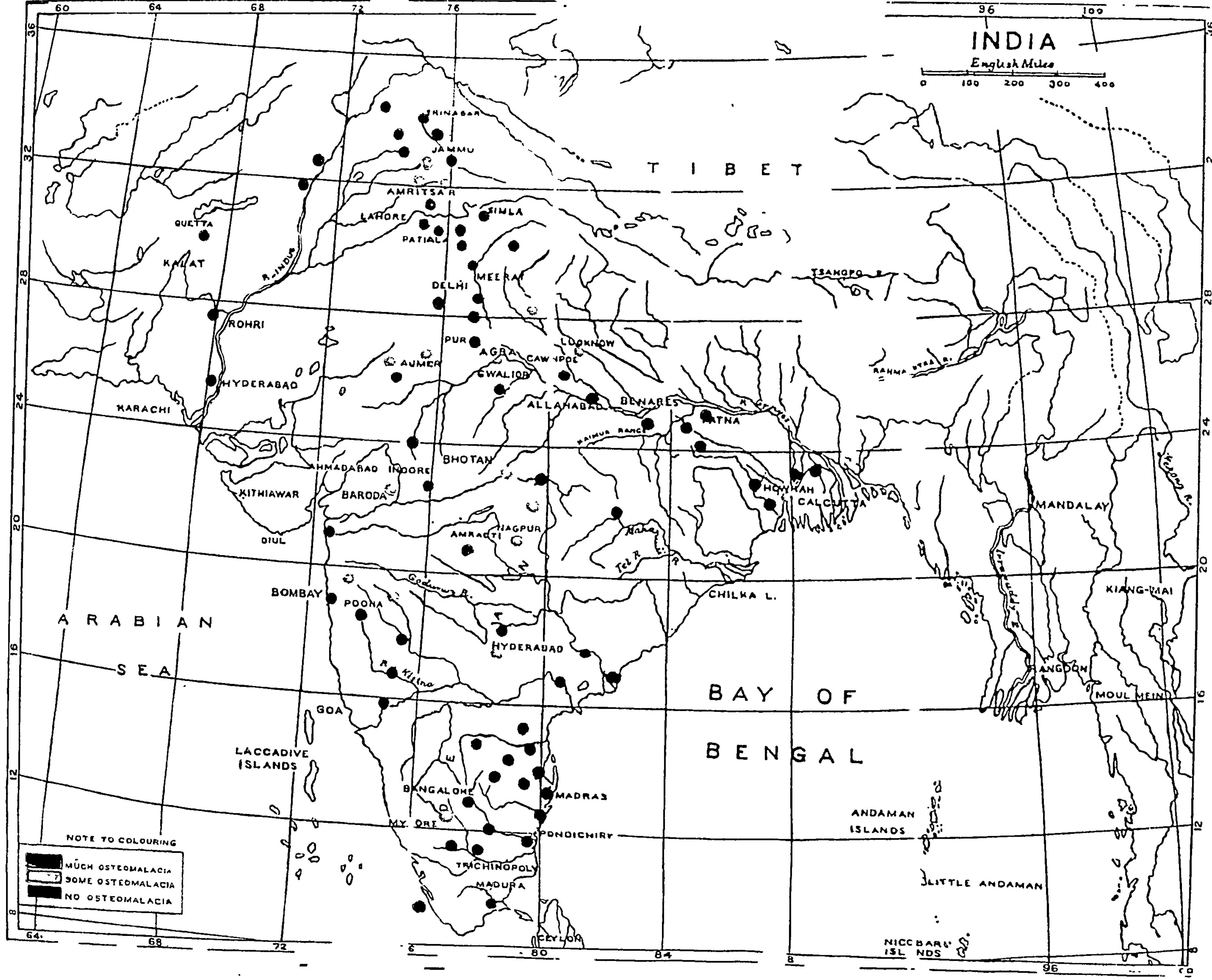
I desire to convince this Association (1) that osteomalacia is present in India in a very marked degree and India like China is at present one of the world centres for the study of the disease (2) that osteomalacia is the cause of more than 17 per cent of the total cases of abnormal midwifery which are brought to our women's hospitals in the areas in which the disease is prevalent (my enquiry shows that 14 per cent of maternal deaths in these hospitals was due to difficult and delayed labour owing to osteomalacia and that 10 per cent of these cases resulted in death of the fœtus) (3) that osteomalacia is a preventable disease and whatever the direct exciting cause may be the predisposing causes all over the world have been proved to be bad hygiene damp dark dwellings little or no exercise lack of sunlight and the lack of fat soluble vitamin A in the diet

It seems ludicrous to speak of deficiency of sunlight in India but when I come to describe the houses in which I found patients suffering with osteomalacia it will be seen that sunlight has been almost entirely excluded In these houses women have lived 10 to 15 or more, years without ever crossing the threshold except for some infrequent domestic occurrence

My enquiry in 1916 took up the following points —

ÆTIOLOGY

The Geographical Distribution of the Disease in India —This is best depicted by the map(*see* opposite) It will be seen that the incidence is more in north India and the Bombay Presidency, the heaviest incidence being in Kashmir There is almost a complete absence in Madras and almost complete absence in the Gangetic Delta The disease occurs in the neighbourhood of rivers on soil of recent deposits, in towns rather than in the country This distribution may be looked at from three


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NOTE TO COLOURING
MUCH OSTEOMALACIA
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JAMMU
AMRITSAR
LAHORE
PATIALA
SIMLA
MEERAT
DELHI
PUR
AGRA
AJMER
GWALIOR
CAWNPORE
LUCKNOW
ALLAHABAD
BENARES
PATNA
BHOTAN
AHMADABAD
INDORE
KITHIAWAR
BARODA
DIUL
AMRAOTI
NAGPUR
BOMBAY
POONA
HYDERABAD
GOA
LACCADIVE ISLANDS
BANGALORE
MADRAS
MY ORE
PONDICHIRY
TRICHINOPOLY
MADURA
CEYLON
HOWRAH
CALCUTTA
CHILKA L.
TSANGPO R.
MANDALAY
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MOUL MEIN
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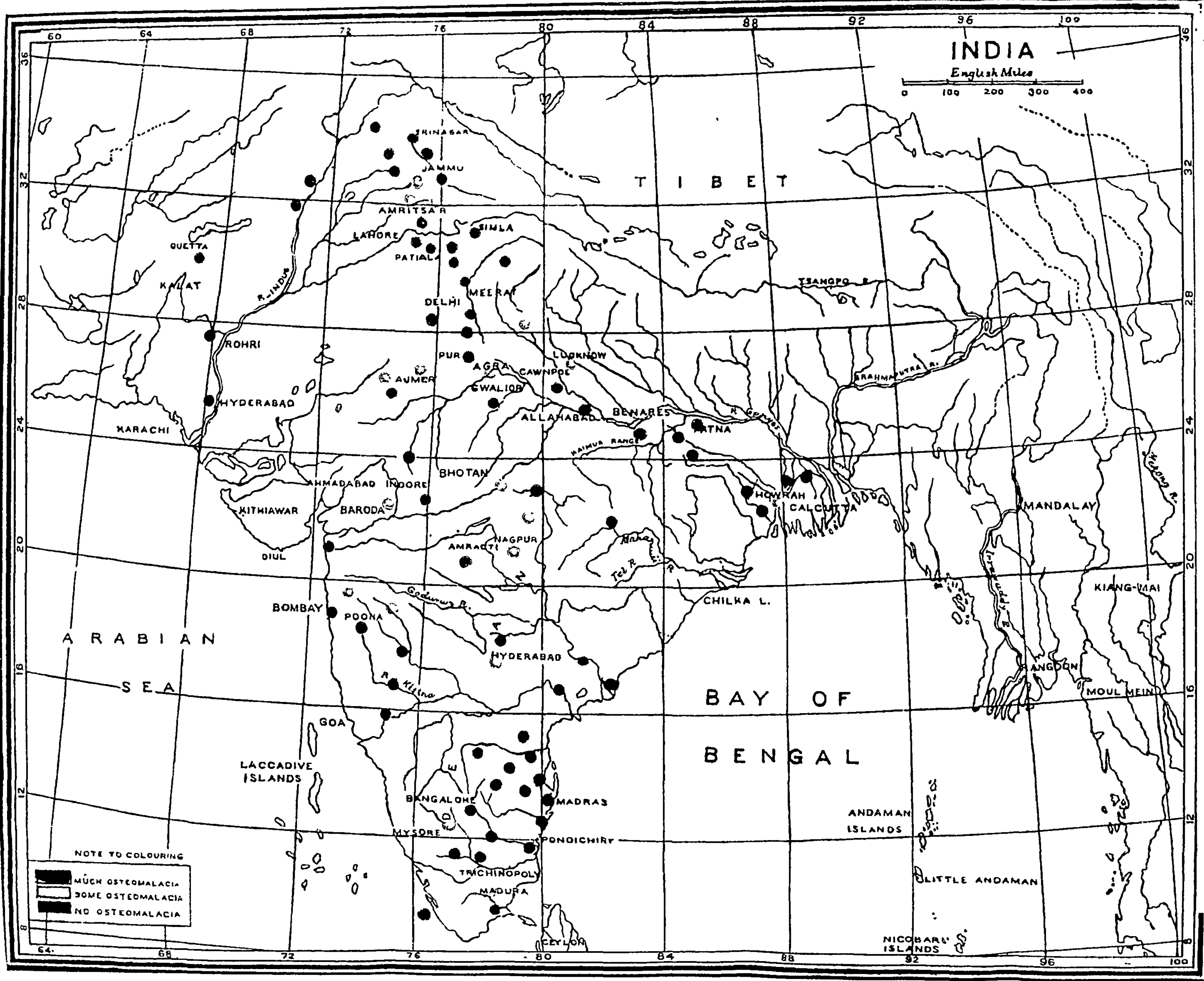
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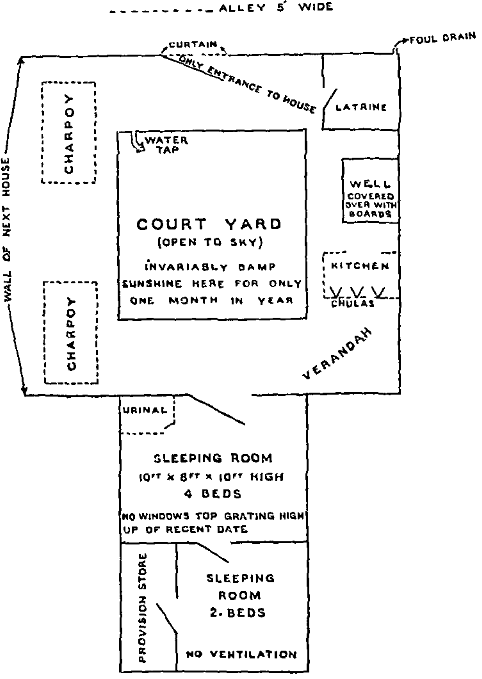
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GWALIOR
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LUCKNOW
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PATNA
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BHOTAN
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NOTE TO COLOURING
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SOME OSTEOMALACIA
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Rough Diagram of a Borah House in Burhampur—inhabited by 10 *adults and* 5 *children.*

(Well to do family)



The upper storey of this house was more airy.

other points of view :—(*a*) *Diet*—With the exception of Kashmir, where rice is the staple food, all the places reporting osteomalacia are in areas where grains other than rice are the staple food. In east and south India where rice is the chief diet, the disease is absent. (*b*) *Purdah*—It is well known that the purdah system is the rule in northern India, while it is much less strictly observed in southern India and among Bengalees. (*c*) Northern India has a very marked cold weather, during which season the symptoms of osteomalacia increase. The houses are made as warm as possible by stopping up every air aperture—frequently with the addition also of a charcoal stove; the people who sleep out on roofs or in court-yards in the hot weather crowd into one room in the cold.

In response to a postal enquiry sent to 153 women's hospitals all over India, I obtained the following information :—Of the 108 hospitals who replied, 47 reported osteomalacia. The total number of midwifery cases reported was 19,754. Of these, 3,198 were cases of abnormal labour from every cause; 572 were cases of contracted pelvis due to osteomalacia (1 in 6). This includes Madras, Mysore and south India, where none of the abnormal cases reported were due to osteomalacia. Excluding these 3 areas, the proportion is just over 1 in 5.

The maternal deaths among these cases were 89, or roughly, 1 in 7. The fœtal deaths numbered 259, or more than 40 per cent.

Water.—Eighteen samples of water were examined for calcium content and animal contamination. From the small number of samples examined, it appeared that there was no evidence of ætiological relationship between the prevalence of osteomalacia and variations in the above two factors.

Environment, Sanitation, Housing, Social Status and Habits.—Of the 58 houses visited, all were in towns, old-walled cities, whose streets are winding and narrow, and on either side of which are drains choked with filth, and alleys used as latrines.

Insanitary Houses.—Small, dark, ill-ventilated, damp; the household latrine, of primitive type and invariably foul, is just inside the front door, through which air from the street penetrates to lower rooms. In addition the houses were usually overcrowded (*see* 'Plan of House'). The disease is not confined to the very poor. Eight of the houses visited were those of well-to-do, not to say, wealthy merchants.

Of the 83 cases actually examined by me, 27 were women kept in strict purdah. The remaining 56 were Hindus, who, though they do not keep the strict purdah observed by Mohammedans, leave their houses very seldom, and the younger members of the family, of an age, that is, when the incidence of osteomalacia is most common, leave the house even less than their older relatives. The daughter-in-law in an Indian household is very often the drudge of the house and suffers much at the hands of her exacting mother-in-law; she has to work hard early and late, most of which work she does in the one room, squatting on ground freshly plastered with cow dung, or on a very low stool.

Caste and Occupation.—In northern India the caste chiefly affected is the Bania caste; this was markedly so in Delhi and Agra. Banias are moneylenders and shopkeepers, merchants of all sorts. In Amritsar the caste chiefly affected was the

Thorax.—Distorted, as if pressed from side to side. Sternum bent with convexity forward: clavicles bent, in two cases the left clavicle was fractured.

Long Bones.—Legs more frequently affected than arms. Tenderness over femur is a very early sign. Bending, mostly forward, occurred in 32 out of 83 of the cases, fractures in 7 out of 83.

Coxa vara and genu valgum were found in a few cases.

Pelvic Bones.—The sacrum is pushed down between the ilia and bent with the concavity forwards so that the promontary approximates to the coccyx. The pubic rami come into juxtaposition a little behind the symphysis (beaking of the pubes). The pubic arch is obliterated. The ischial tuberosities are pressed together, the outlet thus hopelessly narrowing.

Muscles are held tense round the special seats of pain. Spasm of the adductors is a frequent early sign. Trembling of the limbs is marked in some cases. Nineteen cases out of 83 described well-marked attacks of *tetany* with carpopedal contraction.

Digestion.—All except one was ill nourished and even emaciated.

Respiratory.—If the thorax was much deformed, cough and bronchitis occurred especially in the cold season.

Temperature.—Osteomalacia patients often have slight attacks of low fever.

Blood and Urine.—I conducted a series of experiments to estimate the calcium content of the blood and urine in patients suffering from osteomalacia and compared these with that of normal individuals.

I found that the calcium content of the urine was increased and that the increase becomes a deficiency in the presence of pregnancy and lactation. The calcium content of the blood is also increased, but does not appear to be affected by either pregnancy or lactation.

Generative System.—Menstruation was normal, average age at which menstruation began being 14·07. Two of my cases had never menstruated. There was rather more than the normal degree of fertility, the average number of pregnancies being 3·8. Abortions occurred in only 32 out of 330 full time labours.

TABLE

Parturition out of 288 labours

Normal unaided	Prolonged unaided	Forceps	Craniotomy	C S
155	58	24	29	32

The typical history I obtained was that after one or two normal labours came one prolonged, with a dead child (bones plastic). Then came a craniotomy or forceps delivery (bones hardening) and lastly, a Cæsarean section. One patient had

Khatri, also now mainly engaged in trade. In neither caste are the people poor; often they are quite rich. They are strict Hindus, vegetarians; they live in overcrowded, insanitary houses. In western India and the Central Provinces replies showed that the incidence is greatest among the Borah Mohammedans. I observed this personally at Burhampur, C. P. Borahs are also merchants and live in much the same manner as the Banias and Khatris, but they eat meat. The women keep strict purdah. Of the 22 Mohammedan cases examined in north India, all but one belonged to the very poorest class, weavers, bhistis, etc.

Sex.—In the course of my investigation I have not come across one case amongst men, and this prevalence among the female sex is borne out by the report of civil surgeons and other men doctors working in towns where osteomalacia is prevalent among women; they stated that they had seen no cases amongst males.

Age.—The disease appears to be one of the child-bearing period, although I found 13 cases before the age of 15. I found none where the disease had begun above 35. The average age of incidence was 20·7 years.

Of the 83 I examined I found that the average age of marriage was 13·2 years, and the average age of puberty 14·07. Two of my cases had never menstruated.

The Influence of Pregnancy and Lactation.—The mean number of pregnancies in my cases was found to be 3·8; the disease commenced after an average of 2·1 pregnancies. The mean period of lactation was found to be 2·37 years.

Heredity.—The figures collected with reference to house infection are so few that no definite deductions can be drawn from them. Out of 58 houses examined 40 had one case, 16 had two cases, and in 2 there were three cases of osteomalacia.

Osteomalacia and its relation to other Diseases.—No inter-relation between osteomalacia and either goitre or tuberculosis appears to exist.

Symptomatology.

Onset.—In only 2 out of 83 cases was the onset sudden, one began with tetany, one with paralysis and fever.

The symptoms of the remainder began with pain and gradually progressive difficulty of movement.

The pain is described as being in the bones of a dull aching character. The muscles of the legs are kept tense to limit movement. Patients prefer to move themselves.

The gait is characteristic—progression is made as a slow shuffle when a stick is used; when no support is used the thighs are grasped in either hand, the advancing foot is jerked into the new position. Ankylosis and contractures result from lack of movement and the patient becomes fixed in the position in which she found greatest ease at first. Eleven patients I saw who shuffled about the house sitting on their haunches unable to stand upright. Bed-ridden patients lie crumpled up on their beds in more or less constant pain.

Stature.—Diminished due to kyphosis, lordosis, scoliosis, or a combination of all these. The chin often rests on the sternum.

cooked and keep strict purdah It is interesting to note the indigenous treatment in Kashmir is 'Baramulla Clay' (rich in calcium phosphate), pills of fish liver and rubbing with oil in sunlight

In answer to a somewhat hurried enquiry I made recently from hospitals in the Punjab, N W F Province, and Kashmir I gathered the information that osteomalacia is still rife in cities like Lahore, Amritsar and Delhi and that in Kashmir the disease is still rampant The following figures bear out my conclusions —

Lahore reports 64 Cesarean sections in the last 7 years for osteomalacia

Ludhiana reports 72 Cæsarean sections in the last 10 years for osteo malacia

Delhi (2 hospitals) reports 221 Cæsarean sections in the last 10 years for osteomalacia

Srinagar (3 hospitals, one a general one for men and women) reports 367 Cæsarean sections in the last 10 years for osteomalacia

The rest of the Punjab, including Simla where imported cases are found reports 63 Cæsarean sections in the last 10 years for osteomalacia In the North West Frontier Province the disease may be scarcely said to exist

While the study of osteomalacia in India has not progressed markedly in the last 10 years, the study of the disease in other countries has resulted in some very valuable contributions to our knowledge In China Dr Maxwell of Peking Medical College has written a very valuable article in the *Journal of Obstetrics and Gynæcology of the British Empire*, 1925, Autumn number Dr Maxwell has been assisted in his work by Dr Wampler of Pingkingchow These two have with others been working on osteomalacia for years

The analogy between China and India is striking in several respects, but I will confine myself to one interesting fact, that whereas in India we have the seclusion of women in the purdah system as a predisposing cause, in China there is the system of foot binding among female children which so cripples them that they are unable to do much more than hobble about the house I think I am right saying that this senseless and cruel custom is almost universal in those areas in China where osteomalacia is prevalent to the extent of 1 to 3 per cent of child-bearing women

In one of the Mission Hospitals in China, 100 Cæsarean sections had been done in the last 12 years Seventy five per cent of patients have tetany In 31 per cent the disease began in pregnancy In Austria, after the war, an epidemic broke out of what was known as 'hunger osteomalacia' This disease was studied by many doctors, notably by Dr Harriet Chick of London The characteristics of hunger osteomalacia were —88 per cent of the cases were between the ages of 40 and 75, 56 per cent of the cases were women, 44 per cent of the cases were men. Chick proved that the diet was lacking in the fat soluble vitamin A On addition of this vitamin to the diet in the form of cod liver oil in large doses, the patients rapidly recovered

had one normal labour followed by eight craniotomies and finally a living child by Cæsarean section.

The course of the disease is very variable. It is chronic, extending over many years with alternating exacerbations and improvement. The duration varied from a few months to thirty years, the average 6·5 years.

Season.—Most patients complained that pain was greater in cold weather (and rains).

That repeated pregnancies and long lactations aggravate the symptoms is certain; during the last two months of pregnancy there is much pain and movements are very difficult. Some improve after confinement. Death may occur during or after parturition or from respiratory trouble.

Discussion.

From these observations what conclusions are we able to deduce? Husband and wife experience the same variations of climate, eat the same food, drink the same water, live, or at any rate, sleep in the same house, yet the man is free from osteomalacia, the woman is attacked by the disease. The woman is confined to the ill-ventilated, damp, dark overcrowded house. The man goes out daily to his work. The woman has to bear the strain of child-bearing and lactation, in both of which conditions the calcium loss to the mother for the benefit of the child appears to be at the expense of the skeleton, though by what means or by what mechanism we cannot tell. The evils of the purdah system are obvious to all educated, thinking people, but a disease like osteomalacia, with its long years of pain and crippling misery, brings the lesson home with a force the magnitude of which cannot be exaggerated.

What have we learnt about osteomalacia in India since my original paper was published? Not as much, I fear, as we might have done. No one has given serious time to research work on it and no association or individual has given money to carry on the enquiry I had hardly begun when I was obliged to resume my hospital duties.

Doctors Hutchison and Patel have noted on cases of osteomalacia in Bombay that it occurs among the Mohammedans, and that it does not appear to be due to any diet deficiency or to child marriage, or prolonged lactation, but to lack of fresh air and exercise. Dr. Grace Stapleton has collected some interesting cases of late rickets and osteomalacia in Delhi. Dr. Margaret Balfour as the result of her enquiry into the causes of maternal mortality and morbidity in India has also figures regarding osteomalacia in Bombay and other parts of India.

Dr. Kathleen Vaughan's paper in the *British Medical Journal* of 6th March, 1926, dealing with osteomalacia in Kashmir created a good deal of interest. She drew the following inferences from her experiences. Out of 29 Cæsarean sections in one year in Srinagar, 25 were for osteomalacia. There were no cases among boatwomen, who live in the open, eat much uncooked fruit and food, tomatoes, etc., work hard, husk rice, pole boats, etc. Other richer women eat food very much

or Jecomalt, but cod liver oil itself is by far the best (4) Electrical treatment [sinusoidal current and electrical bath (galvanic current)] are used in nearly all cases Dr E Pilley M M S, electrical and X ray specialist to the Hospital is of opinion that this method of treatment exclusively would not do much good but that it is useful to satisfy the patient, and combined with medical treatment to help tone up the muscles and relieve spasms (5) Massage with any simple liniment is carried out

Other forms of treatment occasionally used are —(1) Extension splints to straighten out the limbs and to give complete rest as where fractures have occurred (2) Calcium lactate and parathyroid are administered together if there are marked contractures of the muscles Dr Pilley has found them useful only in such cases (3) Hypodermic injections of adrenalin solution 1 m in 1000 in doses of 20 minims twice daily, are used mostly in the obstetric unit and have a marked effect in relieving the pain and other acute symptoms of osteomalacia in pregnant women (4) Always at a third Cæsarean section, and earlier if the patient and her husband desire it and if they have already at least one healthy son the patient is sterilized by some operation on the tubes There is always improvement after child birth, and this procedure will prevent a recurrence of pregnancy with its tendency to cause an exacerbation or fresh attack (5) Double oophorectomy was done only in two cases Symptoms rapidly disappeared after the operation One of the patients was permanently cured except for her bony deformities The other case could not be followed up The objections to this form of treatment even when the patient is to be sterilized, are (*a*) that, though she may consent to it at the time, she afterwards keenly resents having been unsexed, in her own opinion, and in that of her relatives, and (*b*) that in this part of India there is a widespread belief that permanent stoppage of menstruation at any age, will be followed by blindness This superstition, which is deeply ingrained probably arises from the frequency of cataract after the menopause

Discarded modes of treatment are — The administration of oleum phosphoratum by the mouth in gelatin capsules This method was given a trial in 1921, but was not found helpful Removal of one ovary was tried, but had no favourable effect

As to results no patient has ever died of osteomalacia alone Eighty eight per cent of the indoor patients have been relieved of signs and symptoms except deformities of the pelvis or spine or both The 12 per cent not relieved did not continue treatment long enough The period required for complete relief may be three to twelve months

Other doctors report good results from phosphorus oil in cod liver oil, with massage and sunlight

But I would not dwell on efforts after curative treatment, except to urge medical women to seek out and treat early cases in their ante natal work for this is a disease which above all calls for *prevention*

To begin with diet it should be pointed out that the '[illegible]' so beloved of Hindu, which, with much boiled milk, is the only [illegible] allowed in [illegible]

TREATMENT.

The following answer to my enquiry has been sent by Dr. Helen Franklin, W.M.S., Medical Superintendent of the Lady Aitchison Hospital, Lahore. 'I performed a few operations of resection of the ovaries in 1919—1923, removing about half of each ovary. After the operation the patients were certainly very much improved and the pains in the joints and bones generally completely disappeared. I think that operative treatment should be resorted to failing all other treatment. Since 1921 I have treated every case of osteomalacia (both pregnant and non-pregnant) with sun baths, electric massage, and sodium morrhuate injections with very gratifying results, the pains generally go in about a fortnight or a month, the general condition markedly improves, and in most cases the patients have been able to walk before leaving hospital.'

I have received the following notes from Dr. Gertrude Campbell, M.D., CH.B., Professor of Obstetrics and Gynæcology at the Lady Hardinge Medical College for Women, Delhi:—' Out of 102 Cæsarean sections performed in the College Hospital in the 10 years of its existence, 1917—1927, 96 were necessitated by extreme pelvic deformity due to osteomalacia. Osteomalacia is probably on the decrease in Delhi and its environs as many sufferers from it have been sterilized at a second or third Cæsarean section, and advice is generally given as regards its prevention in younger girls of the same family. The increase in our number of Cæsarean sections, because of malacostean pelvis, simply means that the area from which the patients come to the hospital has steadily widened. The number treated as indoor patients shows a decrease since 1924, though the total number of indoor patients, during the same period, has increased from 2,650 to 3,877.

The following table shows the number of cases treated :—

Year.	Indoor.	Outdoor.	TOTAL.
1923	78	95	173
1924	76	146	222
1925	63	82	145
1926	65	47	112

Our routine treatment is :—(1) Keep the patient as much as possible in the open air, and encourage her to sit in the sunlight, and to use her muscles as much as is safe and possible. (2) Try to persuade her to give up a strictly vegetarian diet. This never succeeds, as the patients are practically all strictly vegetarian Hindus or Jains. (3) Administer cod-liver oil, ʒ ii, and syrup ferri phosph. ʒ i, thrice daily, and gradually increase the cod-liver oil to ℥i daily. When cod-liver oil is refused, because its name or smell betrays its animal origin, the patient may be persuaded to buy and take some preparation made from it, such as Ostelin, Palol

in Bengal, but cases of late rickets in Bengalees are also seen and these resemble osteo malacia The tendency to adulterate foods and feed on artificial patent milks and overcrowding make it probable that without education we shall often see the disease here

Dr E Hamilton Browne (Central Provinces) With reference to the paper on 'Anæmia of pregnancy,' I would like to tell the meeting of some cases of anæmia of pregnancy which I have seen lately It happened that quite a series of these cases came into the hospital where I was working and as my experience had been that in these cases exhibition of iron and arsenic was of no value I decided to try the effect of protein shock in the hope of stimulating the hæmopoietic organs to form blood For this purpose I gave one series of injections of sterile milk and another injections of their own blood (auto sero therapy) I found that the percentage of hæmoglobin increased slightly with the milk injections but more markedly in the cases which had blood in jections In one case that I remember a patient who was pregnant eight months came in for treatment with hæmoglobin ten per cent and after five injections of blood exten ding over a period of four weeks the hæmoglobin percentage had increased to 45 per cent Her parturition and the puerperium were uneventful and the patient left hospital taking her child with her

Dr A Lakshmanaswami Mudaliar (Madras) I desire to express my sincere thanks to Dr Balfour for focusing the attention of this Congress on a problem which I have felt was indeed a very grave one in the field of obstetrics I am in entire agreement with her when she states that the largest number of deaths are due to the anæmia of pregnancy Out of 385 deaths which occurred among 16 517 cases confined at the Government Hospital, Madras for women and children in six years, there were 57 deaths from anæmia while there were 52 deaths from sepsis and 28 deaths from eclampsia The death rate from anæmia varies between 30 and 10 per cent, while in puerperal eclampsia the mortality rate is less than ten per cent As I was entering this hall Col Green Armytage remarked that the low rate in Madras was rather surprising and whether it is due to a statistical error or to the mild types that we meet with there I would leave it to the several members of our profession present here, whom we have had the pleasure of wel coming at the hospital in Madras to decide

There was one remark of Dr Balfour s which was not in strict accordance with our experience in Madras She said that while the colour index was always high, in about 50 per cent of cases there were nucleated red blood corpuscles We hold that a case should be classified as pernicious anæmia if the colour index is high and if there are present nucleated red cells in the blood These nucleated corpuscles are found if the blood be examined frequently and the presence of megaloblasts is particularly significant In these cases there are exacerbations when the blood crises occur and when such crises occur, the nucleated corpuscles can always be found in fair numbers Such blood crises generally occur when diarrhœa sets in when there is high fever or sometimes when the patient is in labour

With regard to the clinical picture of a case of pernicious anæmia, it may be stated that it is a disease of the later months of pregnancy very much like eclampsia, but while eclampsia occurs in 80 per cent of cases in primiparæ pernicious anæmia occurs far more frequently in multiparæ The appearance of the patient is characteristic, the

has lost, by its prolonged cooking, the valuable vitamin which is to be found in fresh butter. The addition of fresh vegetables to the diet should be urged, some of which may be eaten raw or only slightly cooked and, above all, that more attention should be paid to the diet of growing children.

We medical men and women* must strive to educate public opinion, so that the evils of the purdah system are abolished; so that God's free gifts of fresh air and sunlight are admitted into every home; so that women may be allowed to walk and take exercise out of doors, in the light and air (purdah women are occasionally allowed out in groups at night only); so that men will be ashamed if their wives are found to be suffering from a disease which is manifestly due to bad housing, which the men are loath to change because it means an outlay of money; money which is, instead, spent in senseless prodigality, in this country, on jewellery, weddings and funerals.

DISCUSSION.

Lieut.-Col. V. B. Green-Armytage, I.M.S. (Bengal): In corroborating Miss Balfour's views wished to lay stress on the fact that, in his opinion based on the theory and work of James Young of Edinburgh, the primary cause of the anæmia was a toxin from the placenta; that the toxin lowered the resistance, and that the presence of the streptococci and the aplastic anæmia was indirectly the result of the toxin from the placenta. He was also of opinion that the sooner the case was diagnosed the better, seeing that the mortality was 60 per cent of those who went to full term. It would seem unfair to assume that medical treatment was going to or has done anything to lessen this mortality. He would, therefore, advocate *X*-ray therapy early to kill the fœtus, and so annihilate this active absorption from the placenta. By this method after three to four applications the ovum dies, the placental vascular and lymph sinuses close and, about the tenth day, the ovum is expelled, there is no bleeding, no shock, and no puerperal sepsis.

In 30 cases between the fifth and sixth months only four had died after this treatment. He did not believe that any medical treatment was of avail in these cases that were of the progressive aplastic anæmia type, except diet plus liver, and he believed that procrastination was wrong. It was a curious fact, but supported by James Young, that these cases did not necessarily recur with the next pregnancy—thus providing evidence that the aplastic anæmia is subsequent to a toxin from a placental area of degeneration.

With reference to *osteomalacia* he would draw attention to the fact that in the early stage, cod-liver oil, combined with radiated cholesterol, seven grains to the teaspoonful of paraffin, was a most excellent remedy and that low Cæsarean section was the best operation for these cases when seen late in labour. It should be known that oöphorectomy as a method of treatment is absurd and that only education and ante-natal supervision can lessen the incidence. Osteomalacia is a common disease among Marwaris

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* Women doctors are sometimes accused by those who do not know, of whom not a few are men doctors, of pandering to and keeping up the purdah system. This is sheer nonsense. No medical woman that I have known does anything but condemn it. We see too much misery and ill-health behind the purdah to want to keep it a day.

gastro intestinal disturbance, e g vomiting and diarrhoea are very common Fever is not always present Dilatation of the heart is very marked in most cases

Regarding treatment, I have found injection of citrated human blood along with some preparation of arsenic, if there be no lesion in the kidneys very useful in my practice With regard to the termination of pregnancy as a rule I leave it to Nature as these patients stand the strain of labour much better if left alone

Dr R H H Goheen (Bombay) The treatment of Addison s anæmia with massive doses of hydrochloric acid and with a diet in which liver in particular or other dark meats are abundantly provided is proving gratifyingly successful Has this been tried in the anæmia of pregnancy ? Personally I have had little or no experience with the latter disease

Dr K G Nerurkar (Central Provinces) Dr Hurst of Guy s Hospital London has described the ætiology of pernicious anæmia particularly in respect to the *Strepto coccus longus* found in the duodenum

Dr Subodh Mitra (Bengal) With regard to the treatment of osteomalacia if the removal of the ovaries be the treatment of choice we can do the same by high voltage deep *X* ray therapy The treatment may be completed in 10 to 15 minutes whereas it will take weeks to do the abdominal operation and reach complete recovery which may not always be uneventful

Dr P C Roy (Bengal) I beg to offer my hearty thanks to Dr A C Scott for her excellent paper I am extremely sorry to find her still in the same place where she was ten years ago when she published her Contribution to the Study of Osteomalacia in India ' in the *Indian Journal of Medical Research* in 1916 17, for especially as regards treatment, she could not enlighten us very much

Having been connected with the Marwari Hindu Hospital Calcutta for the last 25 years and practising amongst the same community where the incidence is very heavy I have treated over three hundred cases both in the hospital and in my private practice Of these cases, some were well marked and I showed a good number of them to Dr Kedar Nath Das and to Col Green Armytage I have lately been treating a high class Bengalee woman suffering from this disease This is the only case I have seen amongst Bengalees Of all my cases five Cæsarean sections were performed in private houses, two were done by Dr Kedar Nath Das one by Col Leicester one by Col Steen and one by Dr B D Mukerjee Craniotomy had to be performed in many cases

Ætiology—Osteomalacia is a diet deficiency disease and closely allied to rickets I may, therefore, recall the factors which particularly produce rickets (1) faulty diet, (2) lack of movement, (3) lack of sunshine To these we may also add the following factors producing osteomalacia (4) deficient supply of salts suitable protein and carbohydrate, (5) deficiency in the necessary vitamines, (6) defective activator for the calcium metabolism

As regards *predisposing causes* I may mention the factors which retard calcium metabolism as being (*a*) menstruation, (*b*) pregnancy especially when it takes place fre quently, (*c*) lactation when in excess, (*d*) faulty function of the ovaries, (*e*) pathological changes in the parathyroid gland

Symptoms and Diagnosis—The first sign is pain The peculiar character of the pain is a diagnostic sign It is of an aching character, coming and going, better some

pallor, the pearly white conjunctiva, the offensive breath, the spongy gums which may occasionally bleed, the ulcerated tongue and buccal cavity, the extreme weakness, the absence of any emaciation—all these present a characteristic picture.

The heart shows well marked secondary changes but there is little or no albuminuria but moderate fever is present very often. In many of these cases labour is premature and precipitate and it is at this time that the patient passes through a crisis. Fully 50 per cent of our cases die at the time of labour or within 12 to 24 hours after. It is not known why labour should occur prematurely or should be precipitate, but the fact that a blood crisis is often associated with severe cases, lends colour to the suggestion that perhaps it is due to an increase in the CO_2 content of the blood consequent on the diminution of the red blood corpuscles and the total quantity of hæmoglobin.

I had hoped with Col. Green-Armytage that Dr. Balfour might have given us some clue in regard to the treatment of this, the most fatal of ante-natal complications. With one method of treatment advocated by Col. Green-Armytage I must express my disagreement. I do not think it would be a safe procedure to induce labour with laminaria tents or with any other method in these cases of anæmia for two reasons; the induction may itself lead to a crisis, and, secondly, it is of the greatest importance that there should be no risk of sepsis. Our teaching is that, as far as possible, labour in a woman with pernicious anæmia should terminate naturally and that frequent vaginal examinations or application of forceps or artificial delivery lead to an increased susceptibility to puerperal sepsis. The treatment so far has been rather disappointing. The usual hæmotinics have not been successful. We have tried thymol in some cases administered in one grain doses t.d. dissolved in rectified spirits, and gradually increased until 15 grains are given daily. In some cases this has proved useful.

With regard to *osteomalacia,* the disease does not occur in southern India. I have not seen a single case of true osteomalacia in over 40,000 deliveries during 15 years of practice. If Dr. Scott or any other doctor would come to Madras and show us any cases we would be glad, although I hope for the sake of south India that the attempt would be a failure. We have enough complications in the ante-natal period and we trust we shall not be burdened with this disease as well.

Dr. B. Shaha (Bengal): It has been found out by workers all over the world that blood transfusion does not do good in cases of chronic anæmia, particularly where the primary cause is not known or cannot be eradicated. It is a very good method and the only life-saving one in traumatic hæmorrhage leading to acute anæmia.

In the aplastic type of pregnancy anæmia, I have met with signs and symptoms of spinal cord degeneration, such as lightening pains like those of tabes, exaggerated or lost knee reflexes, was there any pathological changes in the spinal cord known as subacute combined degeneration? Various authorities have described in connection with Addison's pernicious anæmia that in some cases the spinal cord change precedes the picture of anæmia in other cases it follows.

Dr. Baman Das Mukerjee (Bengal): Cases of anæmia in connection with pregnancy are more common from July to November than at other times. They are also more common after the fifth month of pregnancy. The clinical picture is as follows:

and two were past the menopause one being at least 60 when the disease commenced This would confirm the opinion that treatment by bilateral removal of the ovaries is certainly not justified as in these cases the ovaries had not attained their full function or else the days of their most active function had passed

(3) *Symptoms*—Incidence of fractures These are common if looked for in certain places, but they are often only partial and the periosteum is intact so that the patient is unaware of them unless a slight accident occurs to complete them and separate the ends of the bone The commonest sites are the upper parts of the ulna and fibula and the lower third of the femur One patient was seen with as many as five fractures of the right forearm without ever having lost entire use of the arm or knowing what had happened Very slight force even muscular action may complete the fracture e g one patient s humerus snapped while lifting a cup of water and another broke her femur while sitting on her bed washing her hair

(4) *Relation between late Rickets and Osteomalacia*—Attention was first called to the incidence of late rickets in India by the late Major H S Hutchison I M S who in the course of a house to house visitation in Nasik in 1921 found many cases When collecting a series of osteomalacia cases in Delhi and elsewhere one soon became aware of the fact that all the younger patients without exception below 17 or 18 who had had the disease more than a few months showed the epiphyseal enlargements at the wrists ribs and elsewhere which occur in infantile rickets and if the wrists are X rayed bony changes of a similar nature are found the younger the patient the more typical the signs As Dr Scott has shown the purdah conditions with lack of sunshine and exercise are exactly those in which rickets might be expected to arise The results of treatment too justify the contention that osteomalacia is only rickets of the adult for if patients are treated with large enough doses of cod liver oil, i e at least three ounces per day and sunbaths then rapid improvement occurs in the great majority of cases This has also been proved experimentally by Korenchevsky working on the ætiology of rickets at the Lister Institute in 1921 for he tried rats under certain conditions of dietetic deficiency and found that all the younger animals developed bony changes characteristic of rickets while under the same conditions the older animals showed the changes of osteomalacia

Dr Margaret I Balfour (Bombay) in reply stated that she agreed with Col Green Armytage and other speakers that ordinary methods of treatment for anæmia were of little value She had tried the liver diet now used for Addison s anæmia in a few cases and had found it useful in those cases where the patients would consent to take it She had recently tried an anti serum prepared from *B welchii* but it was too soon to give an opinion as to its usefulness Vaccines had been prepared from the urinary organisms in some cases but on the whole there had not been marked benefit Treatment with corpus luteum extract had given no good result In severe cases induction of labour sometimes led to fatal results Hydrochloric acid had been tried without much effect but very large doses were not tolerated Rest in bed good nursing and a diet rich in vitamines no doubt assisted all other methods of treatment

No signs or symptoms indicating of changes in the spinal cord had been found

Dr Kedar Nath Das (Bengal) (Chairman) I am sure I am voicing the opinion of this section of the Congress when I say that we fully appreciate the painstaking work

days and worse in winter. The pain occupies mostly the lumber region and the flanks corresponding to the lower ribs. Patients walk with a peculiar gait. The bones become soft in spots and distinctly tender. The disease produces a characteristic pelvic deformity as well as a deformity of the chest and vertebral column. Radiograms help much in diagnosis.

Age and Sex.—The disease generally begins at the age of puberty, but I have seen many cases who developed the disease at the time of the menopause. I have seen one case as early as nine years of age. It is mainly a disease of women but men are also rarely attacked. I have seen a young man aged 18 years suffering from osteomalacia. In Dr. Scott's paper and in the discussion which has followed, nothing much has been mentioned about treatment. The process whereby calcium is laid down in the system and a negative calcium balance is turned to a positive one, and the method whereby the calcium is drained from the bones has not yet been ascertained. We have come to know, however, that large doses of cod-liver oil, calcium and phosphorus can remove some of the symptoms although they cannot cure the disease. I have been getting extremely good results by the administration of irradiated cholesterol and quite a number of well marked cases have recovered completely. I asked Col. Green-Armytage and our President to see an extreme case of osteomalacia in an aged Marwari lady, whose life had become so very miserable that with the help of four expert nurses I could not give her any relief. By exhibiting irradiated cholesterol for about six months, she became completely cured and can now walk miles together. I have been treating many cases with this particular drug with much benefit. I always get my supply of cholesterol in bulk from E. Mercks, Germany, through Messrs. Martin Harris & Co. It is, however, a costly medicine. I follow the American worker, Dr. Hen's method for irradiation. A thin layer of cholesterol is placed in a Petri dish and irradiated by a quartz mercury vapour lamp (K. B. B., atmospheric type, 220 volts) for one hour at a distance of one foot. The irradiated cholesterol is then dissolved in liquid paraffin so as to make a three per cent solution. Irradiated cholesterol when kept for some time loses its curative power and one should, therefore, irradiate the drug in small quantities at a time. When it is kept dissolved in liquid paraffin, it retains its potency for a much more longer period than when it is kept as a dry powder. It should not be exposed to the mercury vapour lamp for a longer period than one hour because in that case it becomes inactive. In laboratory experiments, it has been proved by many workers that irradiated cholesterol has a very powerful anti-rachitic property. In such cases a three per cent solution of irradiated cholesterol in liquid paraffin is administered in two drachm doses, twice at the beginning and then thrice daily.

Dr. G. Stapleton (Bengal): Several points have been raised by Dr. Scott's paper.

(1) *Incidence.*—The paper stated that osteomalacia showed an almost complete absence in the Ganges Delta. If Calcutta is included in the delta, then this is not true, for, though it is not at all common among the general population and does not occur among Bengalees, yet there is a very high incidence among the Marwari community which needs to be investigated.

(2) *Age of Onset.*—One would agree that it is a disease of young women mainly, but not necessarily of the child-bearing age, for, in a series of 73 cases collected in Delhi, many patients were young girls who had barely reached puberty, 30 had had no pregnancy

THE TREATMENT OF VESICO VAGINAL FISTULA

BY

M V WEBB W M S
Women s Medical School Agra U P

VESICO VAGINAL fistula is an uncommon condition in Great Britain and most western countries except in the last stages of carcinoma of the cervix, therefore very little attention is paid to it and the description of its treatment given in most textbooks is scanty Tue Dec 10 A 1 P M

In India owing to the prevalence of contracted pelvis and the lack of skilled attendance for women during labour it is a common gynæcological complaint During 18 years of practice I have seen perhaps a dozen cases due to some other cause than contracted pelvis with obstructed labour Doubtless there have been many more in the outdoor departments where cases of inoperable carcinoma are seen but my impression is that in this country most of these cases die before reaching the stage of fistula Of other cases one was due to the pressure of a stone in the bladder with a normal pelvis and normal child s head another was caused by sloughing of the vagina and urethra in small pox some others by injury two were post operative and two caused by the treatment given by native midwives for primary amenorrhœa

Some of the cases well deserved the name given by a former colleague ' Disruption of the pelvis Others have had a pin point leak very difficult to find and generally more difficult to cure Some are so contracted with bony contraction due to osteomalacia or with scar tissue following their injuries that access for inspection is extremely difficult and for the ordinary operation impossible

One patient came with the history of the birth of a dead child three months previously On separating the labia no anterior vaginal wall was visible, but a large expanse of the interior of the bladder Four fingers spread out flat went into the hole easily there was no cervix and no uterus could be found at the time of operation Apparently the *dai* had torn it away in the process of extracting the child ! The enormous hole was closed easily by a flap splitting operation

As regards the technique of operation, I owe a great deal to an article by Dr Ida Scudder of the Women s Medical School Vellore In this article she

done by Drs. Balfour, Emanuelov, Mehta and Scott on pregnancy anæmia and osteomalacia.

The papers reveal the extraordinary amount of energy and enthusiasm that have been spent by the authors. I repeat that we have nothing but admiration for such whole-hearted devotion for the advancement of the science and art of obstetrics.

It must be frankly confessed that it is very difficult, nay impossible, to discuss the papers which deal with the ætiology, pathology, bacteriology and statistical data of such important subjects as anæmia of pregnancy, osteomalacia and puerperal eclampsia. Of course, the pathological and bacteriological work has to be confirmed, experimental work repeated, corroborated or rejected, and the statistical data criticized with a view to adoption or rejection. I shall illustrate my point by reference to one point out of hundreds of statistical data brought forward by Dr. Balfour. From her table on the incidence of eclampsia by communities in the Bombay hospitals we find that out of 3,709 cases there have been 15 cases of eclampsia, giving a ratio of 1 : 247. When subdivided into communities they give the following ratios, viz., Hindus 1 : 258, Mohammedans 1 : 210 and others 1 : 267. If we group the total number of cases into Indians (Hindus and Mohammedans) and others, we find that while amongst Indians the ratio works out 1 : 242 amongst others it is 1 : 267, showing the incidence of cases amongst Indians to be only slightly in excess of that amongst others. The fallacy of dividing the number of cases into Hindus and Mohammedans and deducing conclusions therefrom is apparent when we remember the fact that the proportion of Hindus and Mohammedans vary greatly, in different areas. I presume Dr. Balfour's idea is to find out the difference in the incidence of the disease in different communities, but I may point out that such division is likely to lead us to erroneous conclusions in view of the fact that in certain provinces, as in Bengal, the differentiation regarding social environment, mode of living, etc., between a Bengalee Mohammedan and Bengalee Hindu is not at all marked while that between a Beharee or U. P. Mohammedan and a Bengalee Mohammedan is very striking indeed. The most important fact to be elicited is whether eclampsia is more frequent amongst Indians ; I may let you know that statistics of a large number of cases (200,000) collected by me, go to show while in European countries the ratio is 1.: 150, in India, amongst Europeans (8,000) it is 1 : 350, and amongst Indians (4,000 cases) it is 1 : 66. I think I have shown how difficult it is to discuss a paper of such magnitude at such short notice.

I shall now refer to some remarks which emanated from some of the speakers who took part in the discussion. Regarding the treatment of 'anæmia of pregnancy' the impression left on me by the remarks of Col. Green-Armytage is that he seems to advocate emptying the uterus, I must frankly confess that my experience of ordinary methods of induction of abortion, which I followed early in my practice, has been most disappointing and I do not recommend it now. Indeed, I have not done so for years past. But I will now certainly try the effects of *X*-rays as suggested by him. Blood injections seem to improve the condition, but the treatment is difficult to carry out for numerous reasons.

Regarding *osteomalacia*, we see a fairly large number of cases in Calcutta amongst the Marwaris and Bombay banias. I can testify to the beneficial effect of the irradiated cholesterol treatment in these cases.

it is necessary to remove one of the earlier stitches but this does not often happen Test again and yet again if necessary till the wound remains perfectly dry The vaginal flap can then be closed with catgut stitches and a very light vaginal packing of gauze, soaked in hydrarg lotion 1 in 2000 put in A self retaining catheter is used to drain the bladder

After treatment—Morphia gr $\frac{1}{4}$ is given before the patient leaves the theatre After four hours she is put on tinct opii, m 10 and hexamine grs 10 4 hourly till the fifth morning She must be given large quantities of fluid

The vaginal packing is removed after 48 hours the catheter remains in for ten days except once on the fifth day when it is taken out for cleaning while the enema is given If it becomes blocked by blood clot it can generally be cleared as follows —Pinch the catheter firmly close to the vulva with the left hand with the right finger and thumb compress and stretch the catheter along its whole length, then holding it firmly pinched at the distal end release the proximal end suddenly and in nine cases out of ten the clot will be dislodged It is very important to teach this to house surgeons and nurses who have to look after the patient

There is no need to keep the patient in one position if she is carefully turned over by the nurse

On the fifth morning opium is stopped and the bowels opened by castor oil and enema The careful cleansing of the vulva during the ten days is of the first importance, in fact the after care is nearly as important as the operation itself With nurses and house surgeons who do not realize the importance of watching the drainage and reporting a block instantly the patient s chances are poor No detail is too small to be noted in giving the orders for post operative care

Modification of procedure when the urethra is in the fistula edge—This constitutes a very great difficulty owing to the lack of tissue on the urethral side The opposite flap must be freed even more than usual in order that it may be brought forward over the urethral flap This latter is excessively delicate and with the least tension on the stitches it will give way Often the urethra is occluded by scar tissue at the fistula edge but this may be cut off It is of the very greatest importance in these cases for the catheter to drain freely and remain *in situ* till the fifth day, if a clot forms and cannot be dislodged as described above run in a little boric lotion to clear it

There remain some cases which I would describe as 'inoperable' That is where the fistula is inaccessible or there has been too great destruction of tissue for a flap operation There are then two alternatives

(a) To close the vaginal opening

(b) To transplant the ureters into the sigmoid

Closing the vaginal opening has obvious disadvantages among those which are not so obvious is the fact that stones are very liable to form in the vagina Some years ago there was a woman living in Calcutta who went to hospital every

advised operation in the knee-chest position, which position I have since adopted in almost every case.

The most favourable time for operation is about three months after the formation of the fistula; it is never wise to attempt a secondary operation till at least three months have elapsed after the first. The date of operation should be so fixed as to allow ten days before menstruation is likely to occur.

The patient generally needs preparation by soothing and cleansing applications to the vulva, and the administration of urinary antiseptics. Two days before operation she is put on light diet; castor oil 24 hours before followed by two enemas; after the first enema, opium and catechu by mouth and a hypodermic of atropine before the operation.

The vulva is prepared in the usual way, but the only douches used are normal saline and boric lotion.

The patient is put in the knee-chest position before the anæsthetic begins, she must be very firmly propped in place with sand-bags and pillows. Strong traction stitches in the labia minora are useful, and the assistant exposes the fistula by a duckbill speculum held in the right hand.

I have long since discarded all fancy instruments; sharp-pointed Leeds scissors and long rat-toothed forceps, with a curved needle-holder and ordinary small full-curved cutting needles. Small cut pieces of gauze make the best swabs, and they can be dipped in a weak solution of adrenalin if necessary; but the bleeding is much less in the knee-chest than in the more ordinary dorsal position.

It is absolutely necessary to obtain a good view of the fistula and surrounding tissues. Unless a medium-sized speculum can be passed it is useless to attempt a plastic repair operation, that is, where the contraction is bony; if it be due to scar tissue, it can generally be overcome by free lateral incisions.

The first step is to separate vaginal wall from bladder wall all round the fistula. This requires great care not to buttonhole the bladder; it may be necessary to sacrifice some vaginal mucous membrane, but this does not matter. It is not essential to pare the edges, the important thing is to invert the bladder wall, so that two raw surfaces and not merely the raw edges lie in contact. No stitches should be put in till it is ascertained that this can be done all round the fistula without the slightest tension. I use for stitching 20-day chromicized catgut No. 00 with size 18 full-curved triangular needles, two to each stitch. Sutures must be put in first at the two corners; the first needle should be entered parallel with the long line of the fistula, about 1/8th of an inch from the edge, penetrating muscle wall only; the second needle should be entered in the same way exactly opposite, so that when the stitch is tied a good area of tissue comes together. After suturing the two corners, the middle may be done in the same way. Every portion must be carefully tested with the bladder sound as it may look perfectly united and yet a hole remains. After the sound can detect no further outlet, test by a bladder wash of four ounces of boric lotion. If there is the smallest leak, the source must be found and more stitches put in. Sometimes

an ordinary rubber catheter, sutured to skin, for eleven or twelve days He asked for guidance in the treatment of vesico rectal vaginal fistula

Major P Fleming Gow, I M S (Bengal) Thanked Dr Scudder for her able paper He mentioned in the cases he had operated on he had 73 4 per cent successes He preferred chronic gut to catgut and he kept the catheter in until the tenth day and he had never met with a break down later He remarked that in England vesico vaginal fistulas were usually operation sequelæ, and hence there was much less dense cicatricial tissue than in India where they were the result of sloughing after neglected labour

Lieut Col V B Green Armytage (Bengal) was of the opinion that as regards vesico vaginal fistula, we should first divide those present into the optimists and the pessimists, he was in the latter category for long experience as the last trench or court of appeal lead him to believe that there was a great number of cases of vesico vaginal fistula totally inoperable, either because of their size or the contracture of bone and soft parts He considered that the discussion should have been divided into the treatment of the operable and non operable cases for obviously for one of the speakers to speak of a 73 4 per cent success rate was absurd, for he obviously left out or did not count, those that were discharged or not admitted to hospital because they were obviously non operable Such statistics were valueless The opener of the discussion, he observed, did not give any statistics which was in itself a confession of weakness He would be very pleased to send either of the openers large numbers of cases in osteomalacics Do they dare to convince me that they would heal such where no means of access was possible owing to crumpling of the bones? Such a proposal was ridiculous and vitiated all statistics, for, of course, every surgeon got success from the average ' get at able ' case

It has been said by psycho analysts that all surgeons, and particularly gynæcologists, are in part sadists and he was of opinion that it was cruel and unfair to give hope and, time after time, assail cases which were in reality inoperable If it was the contention of the openers that there are ' very few ' cases inoperable, he was bold enough to deny it out of a vast experience and to suggest that they should submit to psycho analysis

However he did not disagree—nay, he applauded their skill and success in those cases which *wer* operable

Dr A Lakshmanaswami Mudaliar (Madras) I desire to associate myself with the previous speakers in thanking Dr Scudder Dr Scudder deservedly enjoys a wide reputation as a specialist in the treatment of vesico vaginal fistula in southern India I wish to offer a few remarks in regard to the treatment of this condition It is essential that the operation should not be done too soon after a delivery, an interval of three or four months is essential and every precaution should be taken to see that the urine is clear, the vagina is clean and that the cervix is not ulcerated Erosions of the cervix or cervical ulcerations, the result of tears during delivery, always impede favourable results A point of some importance is to operate during the inter menstrual period, for if menses should appear within the first five or six days after operation, the chances of recovery are less Another small point to be noted is that the anterior end of the urethra is patent Preliminary dilatation is often needed

bladder walls fall together without any tension whatever. *This is the most essential part of the operation.* The edges are trimmed if necessary.

4. *Suturing.*—This is done with fine silkworm-gut and a fine curved needle. The first suture is placed well beyond the angle using Lembert's method. As each suture is taken, it is caught by an artery forceps which is strung in order on a tape to prevent mixing the sutures later when tying them. The greatest care must be taken *not to include* the bladder mucous membrane. The sutures should be tied, not too tight, and when being tied the edges of the bladder should be *turned in*, using a fine probe if necessary.

Sterile diluted milk is now introduced into the bladder and any point of leakage searched for. If there is a leak, it is wiser to remove one or two stitches in the locality and put in fresh sutures. All leakage should be stopped.

Closure of the vaginal mucous membrane should be so planned as to have the line of sutures on a different plane from those of the bladder if possible. If there is insufficient tissue to cover the site of operation, a piece of fascia taken from the fascia lata or external abdominalis may be used; splitting of the labia minora and turning a flap in has proved helpful. No dead space should be allowed between the two surfaces.

The vagina is painted with tinct. iodi and a packing placed in it.

A rubber catheter (not self retaining) is put into the bladder, carried over the thigh and connected by a long rubber tube which is passed into a bottle hung to the side of the bed. A binder similar to a perineal sheet is applied so that the patient cannot reach the catheter and pull it out. The catheter passes through the opening in the perineal sheet.

The foot of the bed is raised slightly and the patient kept *absolutely quiet* with a bland diet for a week. On the third day the patient is taken to the operating table, the bladder washed with some antiseptic solution and a fresh sterile catheter used. The stitches are dressed. This is done daily for eleven days. The stitches are removed on the eighth or ninth day and the patient allowed to void urine herself on the eleventh day. The bladder sutures are not removed but remain as buried sutures.

A vesico-vaginal fistula should not be considered as inoperable until every effort has been made to repair it. Often on the operating table when one frees adhesions, one is able to accomplish what seemed impossible before a careful, patient and painstaking dissection has been done to free and close the bladder.

DISCUSSION.

Dr. A. H. Driver (Madras): Emphasized the cardinal importance of the freest possible dissection of vagina from bladder, especially the freeing of the lateral walls of the vagina high up, which is essential for the complete dissection of the bladder and the subsequent restoration of the vagina, to something approaching its normal anatomical position. He advocated 00 ultratan catgut for the bladder wall and fine silk-worm-gut for the vagina. He agreed with Dr. Scudder about continuous drainage by

may serve the purpose better (11) In the most desperate cases, whatever tissue is left may be utilized for the construction of an artificial ectopia vesica (12) Chloroform is the anæsthetic of choice Post operative subcutaneous injection of morphia with rectal injections of half per cent sodium bicarbonate solution in normal saline 6 ounces every four hours in association with a similar solution *per os* prevents most of the after troubles of chloroform anæsthesia

Dr Ida Scudder (Madras) replied She still thought nearly every case was operable She had had very bad cases sent her which had sometimes been operated on many times by other doctors, but with care and patience and perhaps repeated operations the fistula was closed As regards recto-vaginal fistula, she was in the habit of dealing with the vaginal opening first and then with the rectal one

Dr Kedar Nath Das (Bengal) (Chairman) Could not agree that all cases were operable There were some cases where the bladder wall had largely sloughed away and the vagina filled with cicatricial tissue He had notes of about 200 operations and had rejected a fair number of cases as inoperable He thanked Dr Scudder for her most interesting paper

With regard to the operation itself, I have always used catgut and close the opening in two layers, the submucous and the vaginal mucous membrane being brought in opposition separately. With regard to the use of silkworm-gut advocated by Dr. Scudder, the difficulty lies in removing these sutures later, for not only do they sometimes cut through the soft tissues, but occasionally a portion of the vaginal mucous membrane is nipped and this may result in small fistula forming later. We drain the bladder by means of a douche to which a 'T'-shaped glass piece is attached, the vertical piece of the 'T' being attached by means of a rubber tube to the catheter inserted into the bladder. Fluid is allowed to trickle straight into a bottle through the horizontal piece and this causes a suction action and drains the bladder. In cases where a primary operation has not been successful, it is no use trying to operate before a period of 2 or 3 months. There are some types of vesico-vaginal fistula in which the operation is very difficult and in some cases impossible. The difficult cases are :—(1) If the fistula is nearer the cervix and in cases of cervico-vesical fistula. (2) If the fistula is at the extreme end of the lateral fornices and near the pelvic bone. (3) If the vagina is badly cicatrized. (4) If the bladder is badly prolapsed and the vesical mucous membrane is thick and congested. If the cavity of the bladder is much contracted. (5) If there is vesico-vaginal fistula and recto-vaginal fistula combined. (6) If the symphysis has given way and there is a bare bone felt either at the symphysis or in the lateral fornices. It would be interesting to hear from this Congress what operative technique is suggested in such cases.

Dr. H. N. Banerji (Bengal) : While working under Dr. K. N. Das in the Carmichael Medical College hospitals, the following facts regarding vesico-vaginal fistula cases have been noted :—(1) Vesico-vaginal fistula either alone or complicated with recto-vaginal fistula is of fairly frequent occurrence. (2) Surgical interference is possible only in selected cases. Anæmia, general debility, extreme loss of local tissue, unhealthy kidneys or urinary bladder conditions generally make a large group inoperable. (3) Complete excision of the fibrous tissue and apposition of healthy cut edges, including all the layers of the vaginal wall on either side, give remarkably good union. (4) Complete repair for large openings (e.g., of 1·5 cm.) in one sitting is unwise, since the procedure causes increase of tissue tension and help the stitches to cut through. (5) Suture materials are the finest silkworm-gut. The ends are kept long, lest they should impinge with the trigonal surface. Chromic catgut is not used since it is invariably absorbed before union has taken place. (6) Sutures are removed by the tenth day. (7) The mounted palate needles cause very little damage to the tissues and also make introduction of sutures easy and nice. These are almost indispensable. (8) A loose pack in the vagina after operation not only prevents the bladder wall from sagging down, but also prevents any stagnation and subsequent leakage of urine. (9) A soft catheter with a 'let off' arrangement every four hours empties the bladder efficiently. Sterilized normal saline is used to wash out the bladder at the end of 48 hours when the catheter is reinserted. Hexamine mixture thrice daily is given to follow suit. (10) In cases complicated with recto-vaginal fistula the rectal wall rent is repaired first, the repair of the vesical side may be done at the same sitting or deferred to the next. Closure of the vagina with establishment of communication between the bladder and rectum is not recommended since it augments the ascent of infection. Colpo-cleisis

Regarding the use of instruments, it was enjoined that if the fœtus cannot be removed by the hand 'the body of the infant is to be divided and thus removed in pieces but this is never to be done when the infant is alive as by this operation both will be killed' The following directions are given with regard to the technique of the operation

'The Mandalagra or Vrigh Sastra knife is to be introduced through the vagina, the head is to be divided and the bones are to be separated and removed A hook is to be fixed in the orbit or cheeks and it is to be extracted Then the hook is to be fixed in the breast, belly or axilla and the child is to be thus removed If the infant be dead and the shoulders present, first divide them at the shoulder joint and then deliver When the abdomen of the fœtus is much swelled divide it, remove the intestines and extract If the breech presents, divide the bones of the pelvis and extract In this manner any part which impedes labour is to be divided and removed so as to save the mother For this purpose much care is required As soon as the fœtus is known to be dead, a skilful practitioner will lose no time in completing delivery, as the woman will die very soon, if the dead fœtus is left in the uterus A pointed instrument should not be employed in performing this operation as it is liable to wound the mother' It will be seen from the above quotations from Wise s commentary that only two instruments—knife and hook are mentioned and they were to be used on the dead fœtus

The knife (Mandalagra) belongs to the group *sotoros* which have sharp cutting edges These are in general six inches in length of which the blade formed a half or a quarter of that length It is evident that such an instrument is far from efficient for perforation of the head I append five different illustrations of the same instrument as drawn by annotators and translators within the last five years (Plate XXXIII figs 1—5)

Regarding hooks the kind used in difficult delivery is mentioned as 'Garbha sanku' This instrument is similarly illustrated in five different ways (Plate XXXIII, figs 6—10) There is one important point in which the annotators differ i e, whether the instrument Sanku is 'sharp' or 'blunt' From available authoritative references I am led to conclude that 'Garbha sanku' is a pointed instrument intended for exerting traction by fixing on some portion of the dead fœtus or a fœtus the head of which has been perforated for diminution of its size The claim of some authors, that 'Garbha sanku' is a blunt hook and can be used on a living fœtus, cannot be substantiated

Lastly, an instrument called 'Yugma sanku' has been described (Plate XXXIII, fig 11) A Sanskrit couplet with its Bengali translation is given by Kaviraj Binod Sen in his book published in 1879 The original source of the couplet is not given by him neither have I been able to trace the original text He gives an imaginary illustration of the instrument, making it look like 'Palfyn's hand' Assuming that the couplet is not an interpolation, there is no justification to draw the illustration in the way that it has been done 'Jujma Sanku' merely means 'Paired sanku' It has been shown that Sanku is a sharp hook,

OPERATIVE MIDWIFERY IN THE PRE-CHAMBERLEN PERIOD WITH SPECIAL REFERENCE TO ANCIENT INDIA.

BY

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THE question I desire to discuss in the present paper is (1) what obstetric operations were known and practised before the invention of the obstetric forceps which saved both the mother and the child, and (2) whether the obstetric forceps were known, as has been occasionally claimed, before the Chamberlens.

The pre-Chamberlen period thus roughly includes 3,000 years, from 1500 B.C., the probable date of Ayurveda, to 1600 A.D. the probable date of the invention of the obstetric forceps by Chamberlen. The Ayurveda, the ancient medical literature of India, has the greatest significance from a medical standpoint. The earliest account of the use of instruments in obstetric practice is to be found in the ancient Sanskrit works, but the descriptions are very meagre and led annotators who attempted to illustrate the instruments to do so in diverse ways.

The best account of dystocia is found in Susruta. It is evident, however, that natural delivery only was considered possible when the head came first. Susruta describes the following difficult attitudes of the fœtus, viz. (1) one lower extremity with a part of fœtus, (2) breech, (3) chest side or back of fœtus, (4) one upper extremity with a portion of the body, (5) both upper extremities, (6) hand, foot and head, (7) one lower extremity out of the vulva and the other leg lying crosswise towards the rectum.

The treatment recommended is very vague. (1) Bring down the other leg. (2) Push up buttock and bring down both legs. (3) Push up the lower half of the body and bring down the upper half. (4) Try to break impaction, push up the head and bring down the child. (5) Push up the shoulders and bring down the head. (6) and (7) Delivery with the hand alone is not possible. Use of instruments is necessary.

It will be observed that in (1), (2) and (4), the recommendation is to bring down the lower extremities (? podalic version). In (3) and (5) the recommendation is to bring down the head (? cephalic version). In (6) and (7), use of instruments is said to be imperative, but it is not clear why it was thought so.

It was Albucassis who described and, for the first time, depicted several obstetric instruments It may be seen by looking at the diagrams (Plate XXXVI, figs 17—25 and Plate XXXVIII, figs 28—37) that these instruments could not be used on a living child

We again skip a period of five hundred years and find in the sixteenth century A Pare (Plate XXXVII, fig 26) describing and illustrating a number of instruments—crotchets, curved knives, nippers, tongs and Pes Gryphii, all of which were evidently meant to be used on a dead child (Plate XXXIX, figs 38—47 and Plate XL, figs 50 and 51)

It was Jacques Rueff of Zeurich who, in 1554, described his 'Forceps longa et tersa' with the declared intention of delivering a living child This was the first expression of an inoffensive and conservative function of the forceps Rueff's forceps possessed in an undeveloped form the essential characters of the modern obstetric forceps Rueff's instrument is stated to have been 14 cm long, 7 for the blades and 7 for the handles (Plate XXXIX, figs 48 and 49 and Plate XL, fig 52) Evidently such measurements were insufficient for practical use Ingerslev states 'perhaps it was used for removing stones from the bladder'

In 1561, Pierre Franco described in detail and illustrated his 'speculum matricis' which may be considered as a real head tractor (Plate XLI, figs 53—56 and Plate XLII, figs 57—60)

A hundred years later in 1668 Mauriceau (Plate XXXVII, fig 27) described some obstetric instruments He had a blunt hook, perforator, crochets and a tiretete (Plate XLII, figs 61—72) Mauriceau also proposed a bandage slipped over the fœtal head for extracting the child

We can conclude in the words of Chereau, 'at that period, there was no mechanical means to deliver a woman with safety, for both herself and her child All the scientific knowledge consisted of perforation of the fœtal skull, extraction of the child with some kinds of forceps with sharp teeth'

Therefore, it may only mean ' paired hook.' So that, the claim that the ancient Hindus possessed an instrument akin to modern obstetric forceps, cannot be substantiated.

It is to be noted that post-mortem Cæsarean section was recommended. Wise says ' When a pregnant woman near the full-time, is suddenly killed as a goat is killed before the altar and should the child move in the uterus, an incision is to be made in the abdomen and the infant removed.' In a foot-note, he further says ' One of my Pandits informed me that in a case that came under his observation in which delivery could not be accomplished and the child was alive, the physician told the husband that unless an operation was performed both would die. It was referred to the woman, who with heroism answered, do not mind me, save the life of my child ! The operation was performed, the wound in the abdomen sewed up and both child and mother recovered.'

It may thus be seen that various obstetric manipulations, podalic *and* cephalic versions, extraction, craniotomy and embryotomy were practised by ancient Hindus. Cæsarean section was also performed.

We now skip over a period of a thousand years and find some obstetric subjects dealt with in Hippocratic writings. We find, how an unfavourable lie of the infant can be changed into a favourable one. We also find instructions, as to how to deal with a dead child by mutilating and extracting it. It appears Hippocrates possessed a compressor, an ecraseur and an instrument called ' Machaire.'

Soranus of Ephesus describes seven instruments for embryotomy (1) a blunt curved crochet, (2) a scalpel for opening the head of the child, (3) a dentated forceps, (4) a forceps for breaking the bones, (5) an instrument for extracting fragments of bones, (6) a pointed knife for perforating the skull and emptying it, and (7) a scalpel for dissecting the head.

Celsus has an interesting chapter on the removal of the fœtus in difficult labour. He suggested rules for effecting delivery either by means of version (cephalic or podalic) or by the help of a hook called ' uncus.' One of these hooks has actually been found in Pompeii (Plate XXXV, fig. 14).

Aetius in the beginning of the sixth century makes mention of turning. Aetius and Paulus Aegineta (an eighth-century author) employed two hooks ' uncinii attracteri ' which were introduced separately and strongly grasped the child's head on two opposite points. These two authors also make mention of a ' Forceps Dentarium and Ossarium ' to practise embryotomy.

Nothing of importance is to be found in obstetric literature until the eleventh century, when we find a reference to some obstetric instruments, the authors being Albucassis and Avicenna.

Avicenna (*see* Plate XXXIV, fig. 13) recommends the use of forceps in difficult labours ; but it is not at all clear whether the forceps, he alludes to, is for the delivery of a living child or is merely a cranioclast.

PLATE XXXIII



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.



Fig. 10.



Fig. 11.

EXPLANATION OF PLATE XXXIII.

Fig. 1. Mandalagra. Supposed form after Wise.

" 2. Mandalagra. Supposed form after Thakore Saheb.

" 3. Mandalagra. Supposed form after Mukherjee and Susruta.

" 4. Mandalagra. Supposed form after Mukherjee and Vagbhata.

" 5. Mandalagra. Supposed form after Mukherjee and Dalana.

" 6. Booreeso or hook. Supposed form after Wise.

" 7. Garbha-Sanku. After Binod Sen.

" 8. Garbha-Sanku. After Thakore Saheb.

" 9. Garbha-Sanku. After Mukherjee.

" 10. Garbha-Sanku or womb-pin. After Sarat C. Das and Pozdeniev. It is one spin long with a crooked end and is used for extraction a dead child from the womb.

" 11. Yujma-Sanku. Imaginary diagram after Binod Sen.

PLATE XXV

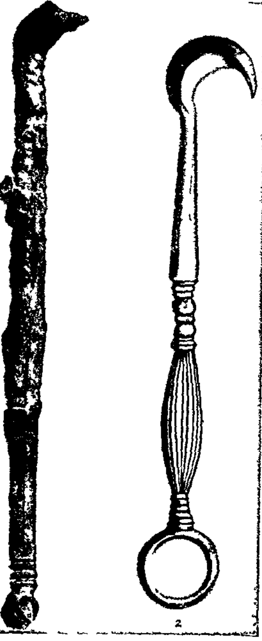


Fig. 14 Traction hook for Embryo from Pompeii in the Naples Museum Size 17 cm (Milne Plate L i)

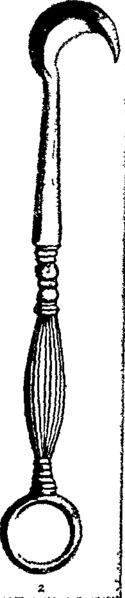


Fig. 15 Ring knife in the Naples Museum after Vedrenes (Milne, Plate L ii)

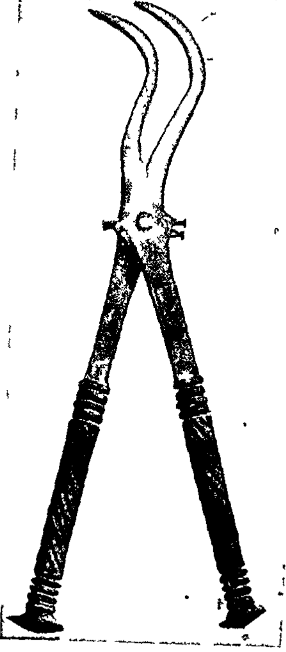


Fig. 16 Pompeian forceps in the Naples Museum Size of original [illegible]1 cm (After Milne Plate XLIII)



Fig. 12. Hippocrates.

Fig. 13. Avicenna. (From Johns Hopkins Hospital Bulletin.)

PLATE XXXVI.

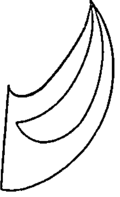


Fig. 17.



Fig. 18.

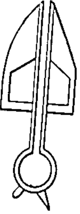


Fig. 20.



Fig. 21.

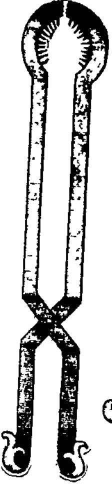


Fig. 22.

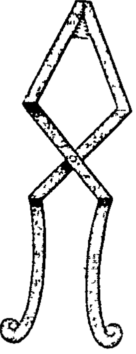


Fig. 23.

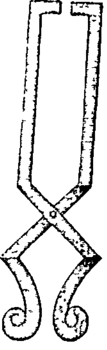


Fig. 24.



Fig. 25.

Explanation of Plate XXXVI.

Figs. 17—21. Different instruments of the ancients for cutting the fœtus, from Albucasis. (From Witkowski.)

Fig. 22. The Almishdach of Albucasis with which he crushed and extracted a large head.

(*N. B.*—The misdach was of the same shape but not so large.)

" 23. Forfex Albucasis. With teeth to crush the child's head.

" 24. Vertigo Albucasis. With which he opened the matrix.

" 25. Embryotome of Albucasis for perforating the fœtal head.

PLATE XXXVII.

AMBROISE PARÉ,
Premier Chirurgien de HENRY II. de FRANÇOIS
II. de CHARLES IX. et de HENRY III.

Fig. 26. Ambroise Paré.



Fig. 27. Mauriceau.

PLATE XXXVIII.

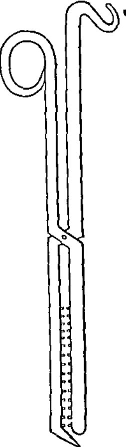


Fig. 28

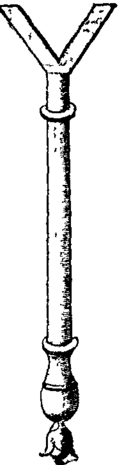


Fig. 29



Fig. 30



Fig. 31.



Fig. 32.



Fig. 33.

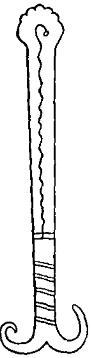


Fig. 34

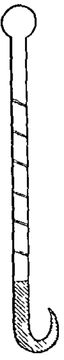


Fig. 35.



Fig. 36.

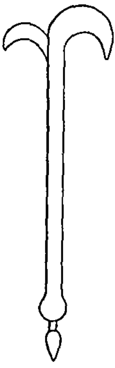


Fig. 37.

EXPLANATION OF PLATE XXXVIII.

Fig. 28. Forceps for crushing and extracting the fœtus, Albucasis.
" 29. Impelleus. To push up the fœtus in the womb.
" 30. Forma Uncinii, Albucasis, with only one hook.
" 31. Another form with two hooks (Albucasis).
" 32. Forma Spatumilis, Albucasis, being sharp at both ends for opening the child's head and breaking the substance of the brain.
" 33. Another of the same person for like purpose.
Figs. 34—37. Crochets employed by Arabian Surgeons, after Albucasis. (From Witkowski.)

Explanation of Plate XXXIX.

Figs 38—40. Crochets employed in the time of Ambroise Paré.

Fig 41. Small curved knife for splitting open the abdomen and head of a dead child in the uterus. (Ambroise Paré.)

" 42. Pes Gryphii of Ambroise Paré, to extract the child's head when left alone in the uterus

" 43. Another Pes Gryphii of Ambroise Paré, of the same shape as fig. 35 but with four branches.

" 44. Nipper of A. Paré for cutting the bones of the fœtus.

" 45. Tongs of A. Paré for the same purpose.

" 46. Another tongs of A. Paré.

" 47. Double crochets with chains, of ancients, according to Andre de la Croix. (Witkowski)

" 48. Apertorium of Rueff (From Witkowski.) ' A large cross-bladed dilator. The blades are convex externally and two hinged bars, crossing each other X-wise, connect their inner surfaces, acting like the spring in more modern dilators ' (Doran)

" 49. Rostrum Anatis of Rueff. For removing a dead fœtus. (Witkowski.)

Plate XXXIX.

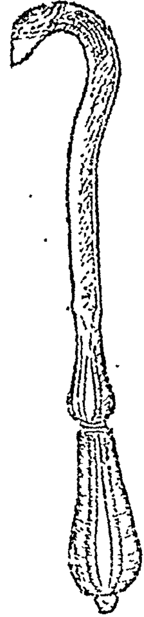


Fig. 38.



Fig. 39.

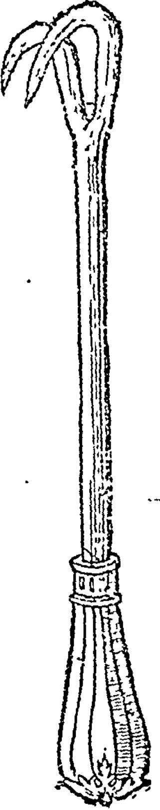


Fig. 40.

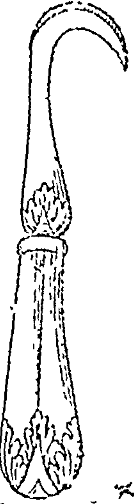


Fig. 41.

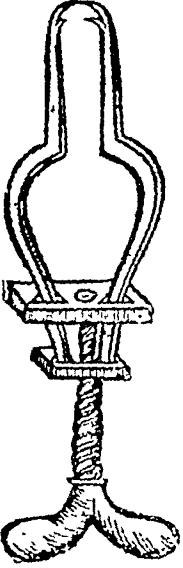


Fig. 42.

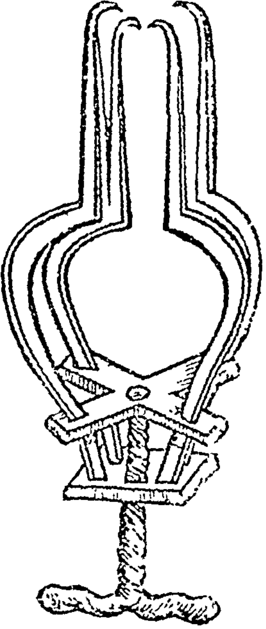


Fig. 43.

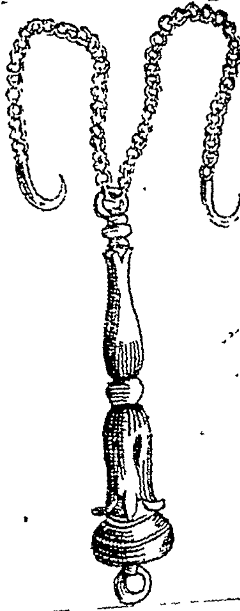


Fig. 47.

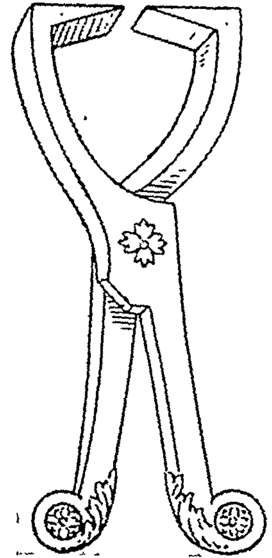


Fig. 44.

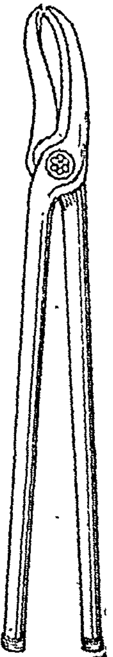


Fig. 45.

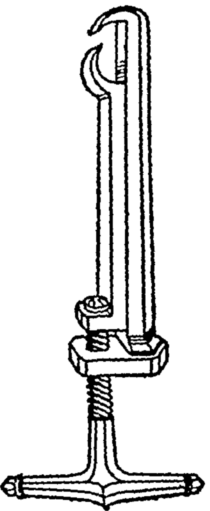


Fig. 46.

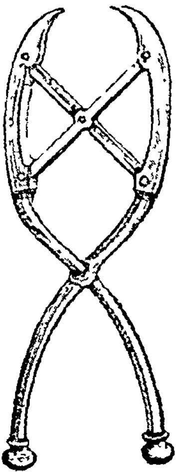


Fig 48.

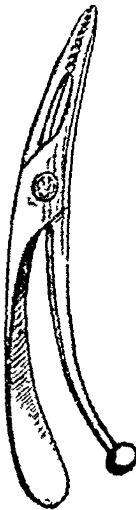


Fig. 49.

PLATE XL.

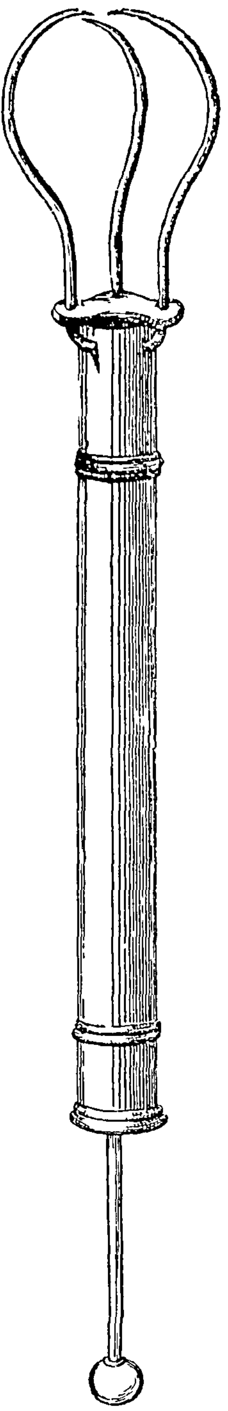


Fig. 50. Extractor of Ambroise Paré which he calls 'Pes Gryphii' from its resemblance to the foot of griffin. It is used to extract moles. (*Open.*)

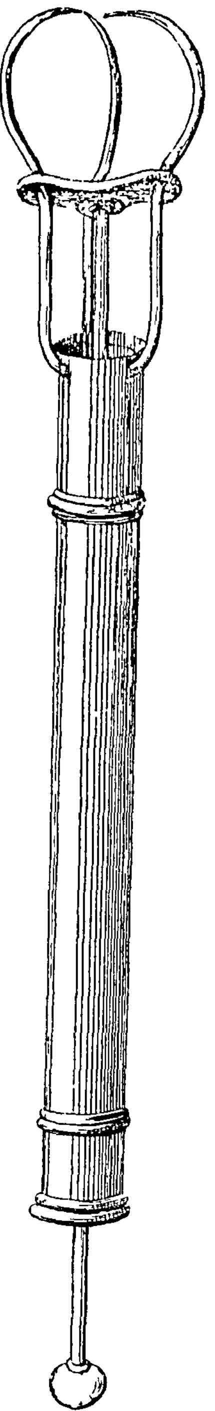


Fig. 51. The same. (*Closed.*)

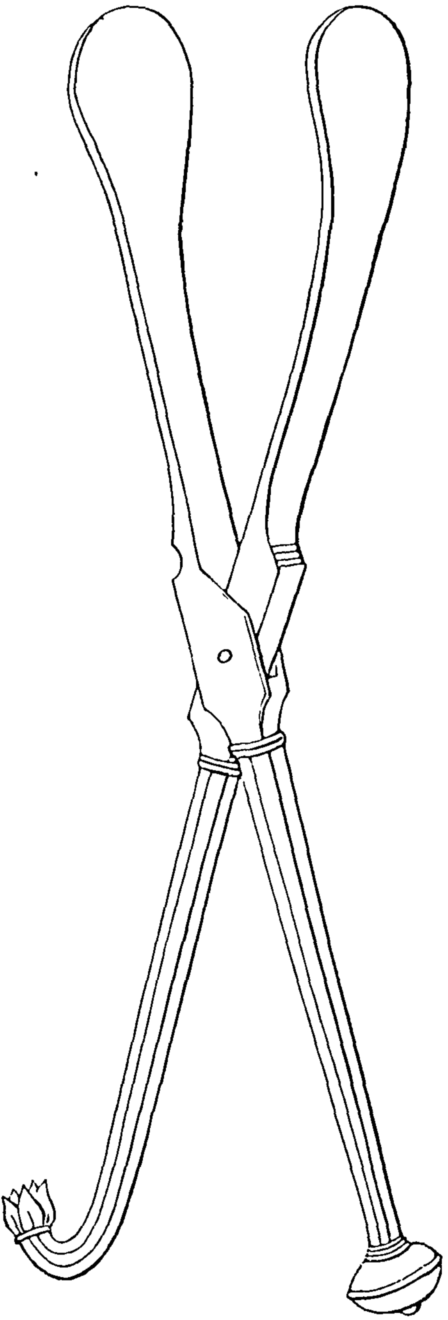


Fig. 52. Forceps longa et tersa of Rueff. (Mulder.)

Plate XLI.

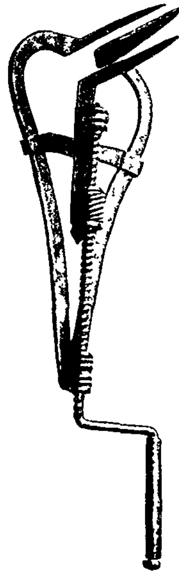


Fig. 53.

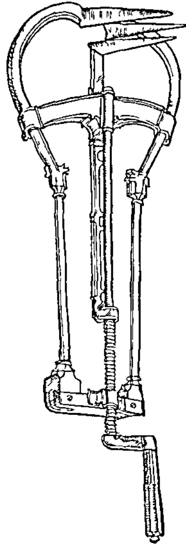


Fig. 54.

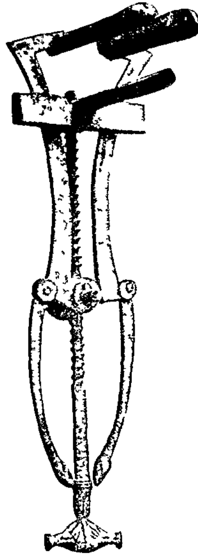


Fig. 55.

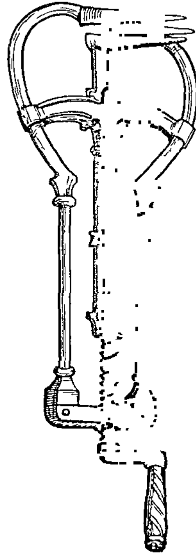


Fig. 56.

Explanation of Plate XLI.

Fig. 53. Speculum Matricis in the Museum of the College of Surgeons and described in the Obstetrical Society's Catalogue (1867), p. 195. This is more precisely described by Doran in J. O. G. Br. Em., Vol. XXVI, p. 132.

" 54. Speculum Matricis, Rueff. From 'De Conceptu et Generationa Hominis,' 1554. (Doran.)

" 55. The Pompeian Speculum. (Doran.)

" 56. Speculum that is to open the anus or the birth parts of women. Gersdorff. From 'Feldtbuch der Wundartzney' 1526. (Doran.)

PLATE XLI.



Fig 53.

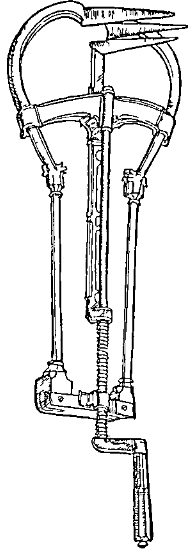


Fig. 54.

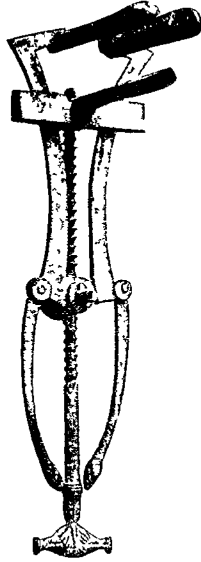


Fig. 55

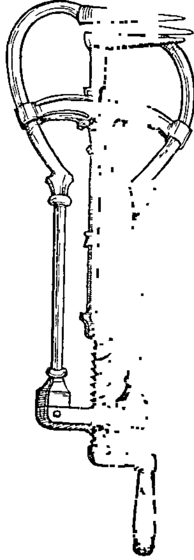


Fig. 56

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„ 56. Speculum that is to open the anus or the birth parts of women. Gersdorff. From 'Feldtbuch der Wundartzney' 1526. (Doran.)

Explanation of Plate XLII

Figs 57—58 Speculum Matricis employed in the time of A Pare (*Open* and *Closed*) (Witkowski affirms that 'Franco represented in his edition of 1561 an analogous speculum and recommended its use for the extraction of after birth ')

, 59—60 Speculum Matricis employed in the time of A Pare Another form (*Open* and *Closed*) (Witkowski)

„ 61—63 Dilators with two and three branches employed in the time of Mauriceau

Fig 64 Tire tete of Mauriceau

65 Tire tete, inner portion shown separately

, 66 Perforator of Mauriceau

„ 67 Tire tete applied to the fœtal head

, 68 Crochet of Mauriceau

„ 69 Perforator of Mauriceau after Witkowski.

, 70 Crochet of Peu

„ 71 Crochets of Peu

„ 72. Hook of Peu

Plate XLII.

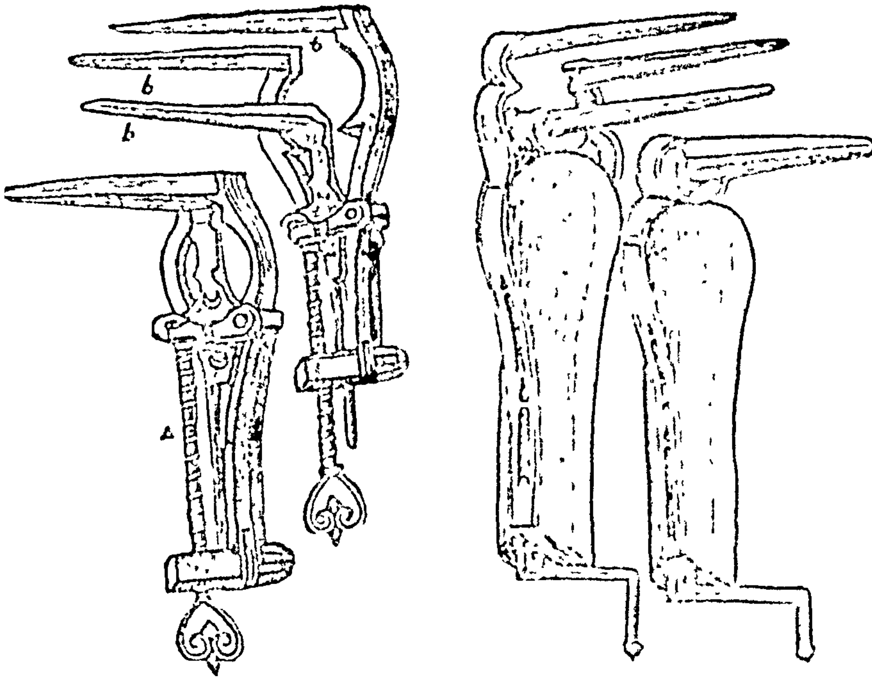


Fig. 57. Fig. 58. Fig. 59. Fig. 60.

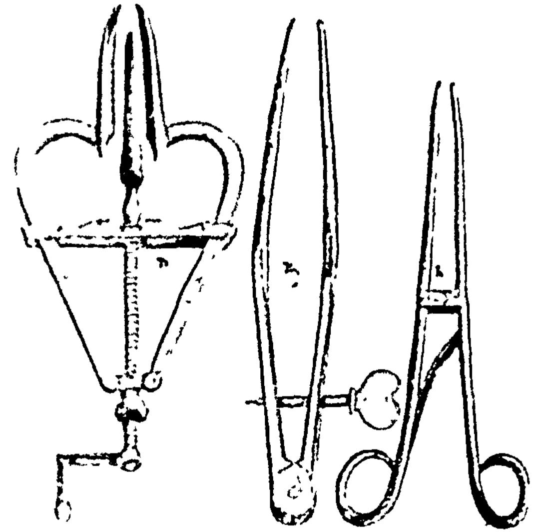


Fig. 61. Fig. 62. Fig. 63.

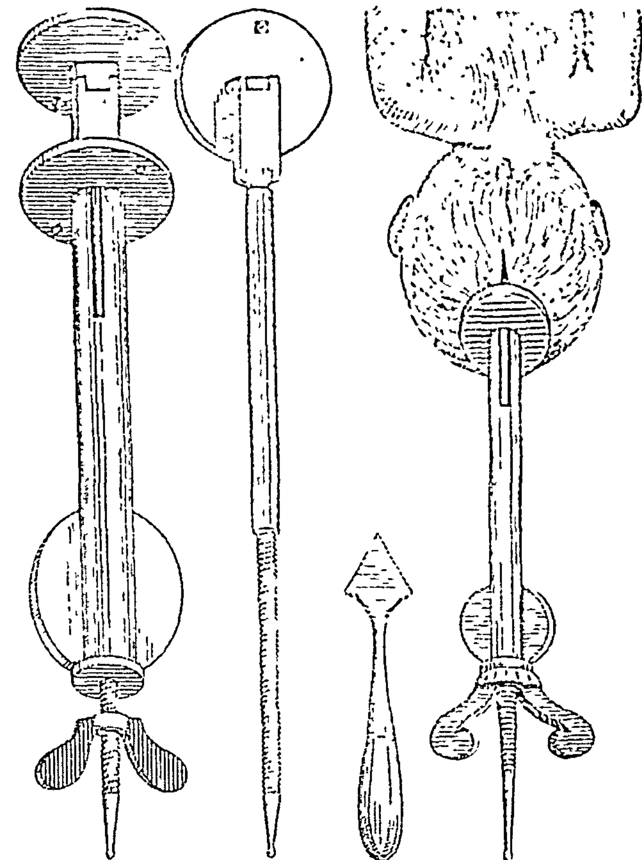


Fig. 64. Fig. 65. Fig. 66. Fig. 67.





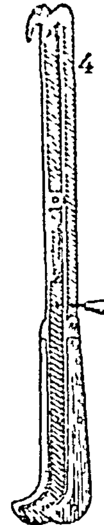


Fig. 68. Fig. 69. Fig. 70.

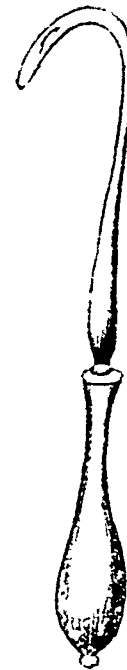


Fig. 71.

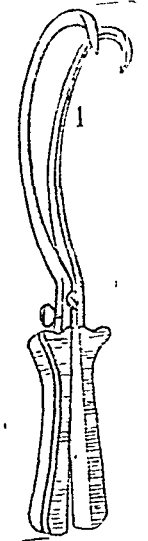


Fig. 72.

DISCUSSION

Lieut.-Col. V. B. Green-Armytage, I.M.S. (Bengal) (Chairman) Wished to thank Dr. Kedarnath Das for his fascinating address, which brought back to them how, step by step, science had advanced from the darkest ages Personally he disagreed with his friend Major Gow, that the speed of modernity gave no time for a study of the past. He was somewhat of a Confucianist or ancestor worshipper, and he liked to think of the words of Ecclesiasticus ' there are of those that have left a name behind them—Praise ye all famous men and their fathers that begat them ' The spirit of modernity that does not revere our famous forebears is to be deplored

Dr Das has shown us that, before the days of Hippocrates, in India, Italy, China and Tibet they had means for destroying and delivering the fœtus It is probable that owing to the nomadic habits of the East and the transfrontier trade routes, that some of the knowledge of *Susruta* passed from mouth to mouth and so passed through Persia and Arabia to Greece, eventually to teach or stimulate Hippocrates Dr Das has fascinated us with his learned account of the ancients, but I think we here to day should remember that 300 years ago Peter Chamberlen made or discovered forceps, whereas Harvey, another Englishman, was the father of British midwifery, reminding me of the words of Milton : ' That when God had a really difficult thing to do, he found his Englishman to do it !' Although we must not forget the debt we owe to two Scotsmen, Smellie and Hunter, in the eighteenth century.

This session is now closed and I feel we part wiser and better people for all we have heard.

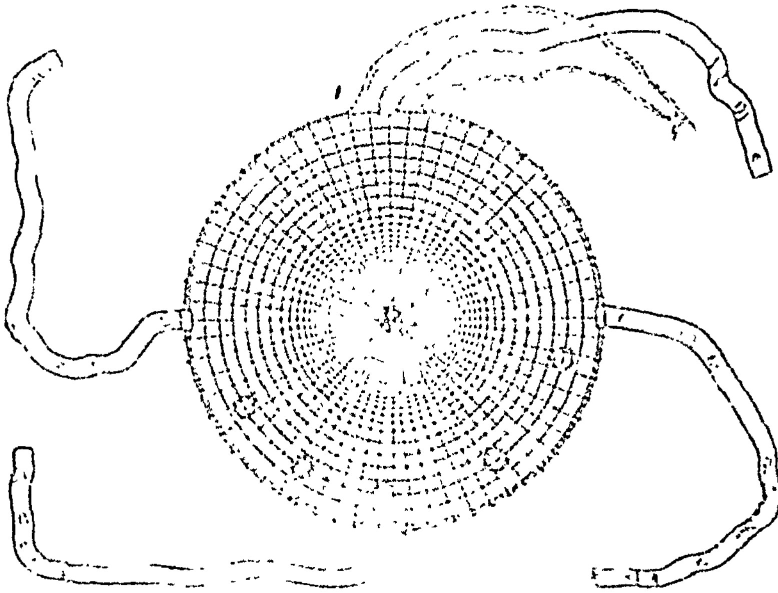


Fig. 73. Amand's net.

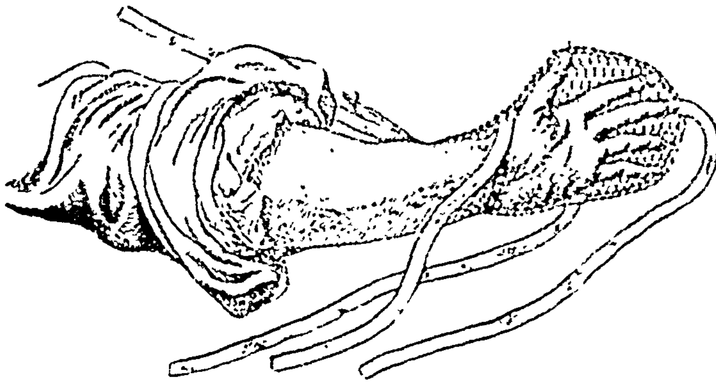


Fig. 74. Amand's net held in the accoucher's hand ready for introduction.

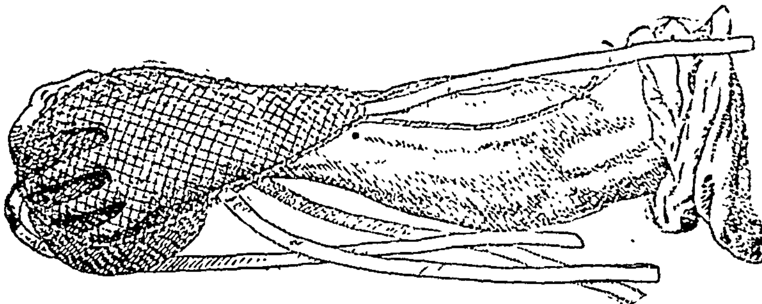


Fig. 75. Amand's net, being applied to the fœtal head.

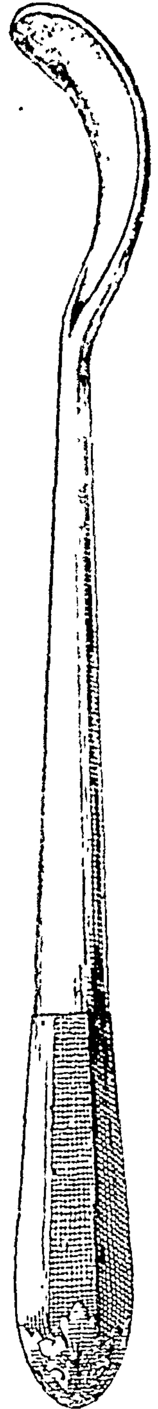


Fig. 76. Blunt hook of Mauriceau. (Kilian.)

are only fixed with both ends, sometimes the lower part is hanging loosely They can fully atrophy and almost totally disappear At the inside of the labia minora, frequently at its lower end smaller or bigger scars are to be found, they are in most of the cases at the commissura posterior or in the fossa navicularis Another favourite place is the vicinity of the urethra, at the frenulum of the clitoris The urethra itself can be found occupied by a corroding ulcer, which is sometimes covered with a miscoloured fur, easily to be stripped off But in a great number of cases the urethra is completely destroyed and in its place a cicatrical mould appears, which is occasionally rather deep and the walls of which are formed by a whitish grey cicatrical tissue Generally this depression is hidden by a bulging of the anterior wall of the vagina which begins beneath the mentioned cicatrical crater and peeps out from the vulva To this bulging corresponds occasionally a little deeper, a small bulging of the posterior wall of the vagina If one removes the first bulging with the spatula or draws it down with some instrument one can overlook the depression, crescent shaped in the transverse section, in the vault of which appears a transverse or more rarely an oblique slit of one or two centimetre's length --through this narrow lumen the probe enters the bladder The sphincter urethræ is completely devastated and often in the margin of the mould, or in it, are to be found small ulcers of the above mentioned form and fur, the size of a lentil Sometimes it occurs that one sees in the bottom of the crater a tiny hole instead of the slit, the size of a pin head In the latter rarer cases the incontinence, in consequence of the described destruction, does occur seldom but on the contrary, *the patients pass urine in drops and this only with great strain* In a sagittal section, the bottom of the mould and the bulging of the anterior vaginal wall would give the impression of an S, Boerma(1) has compared this formation with the mouth of a fish, in a note of a discussion in a conference of Roegholt Both the vaginal wall—*being intact* where it forms the above mentioned bulging, which limits the crater caudally—as well as the form of the border gives the impression as if the vaginal wall had not been affected by the process, but only loosened its basis, which circumstance Boerma, too, had noted He says (l c) that one has the ' indruck von het losgelaten hebben van de vaginalinsertie van de periphere deelen De vagina zelve is intact De urethral vervorming doet denken a een vischbeck '(a) The inner genitals show but little alteration, which is rather striking Among seventeen cases there were two with rather fresh annex tumours and seven cases where there could be stated chronic old affections of the parametrium and the adnexa all bilateral But the alterations were not excessively great The mere fact, that in many cases *no alterations at all* were there, the uterus being easily movable and, except its smallness, completely normal, points out that these statements have nothing to do with the ætiology of the illness Almost always the uterus is small Perhaps this is a sort of atrophy caused by inactivity , for all those patients have

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(a) He probably thinks of the formation of the crater with its frame the upper part of the labia minora and the mentioned bulging as lower limit

STUDIES ON THE PATHOGENESIS AND ÆTIOLOGY OF *ULCUS CHRONICUM VULVÆ TROPICUM (ELEPHANTIASTICUM).*

BY

ROBERT JOACHIMOVITS.

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WITH the following arguments I shall try to fix a typical, tropical state of illness on the female genitals which is little known till now as a coherent form of malady, and quite unknown in its ætiology.

Seventeen cases of this illness have been observed by me in the space of 2 months in Java (Soerabaya). The number of cases seems to vary according to different regions of India ; for instance, at Singapore and its environs the cases are most rare as I could state and have been told by Dr. English and other physicians.

The disease I am going to discuss begins probably always as an ulcer on the exterior female genitals. This fresh ulcer very rarely moves the native women to go to the hospital, they do but come when the process of grave destruction following the initial phase of illness is going on for months and years and renders the patients completely helpless. These devastations, which are the consequences of the long, not healing ulcerous process, are regularly either an incontinence of urine or a stricture of the rectum followed by the impossibility of relieving the bowels ; the illness, initially a dermatological question only, has become in this phase a gynæcological one.

The state of illness presenting itself to the physician at this moment is, as a rule, the following :—

The labia majora are,—frequently more on the one side than on the other,—altered elephantiastically, often of a darker shade, especially at their inner part. It is a dull colour with a shade of brown-blue. Small radiant scars are frequently to be found at the inner part of the labia majora or in the sulcus between labia majora and minora. Not always nor in every case can there be stated this accompanying condition of elephantiasis, but always a change in the consistency of the tissue labia can be noted thus, that it seems chronically œdematous and of a strange hardness. The labia minora are, in the later stages nearly always, very atrophied, also discoloured to a darker shade similar to that, which can be observed often in the vicinity of ulcus cruris varicosum, resulting from the destructions and storing up of red blood cells. The small labia are often altered into thin folds or stripes, sometimes undermined in their middle part, so that they

(2) It has a very slow and chronic development 'Ces rétrécissements sont remarquables par la lenteur de leur développement' The stricture changes the affected part of the rectum slowly into a stiff cicatricial tube, the surface being covered with a discoloured mucous rankling fur(*a*), with rather an uneven bottom The stricture can be so narrow that only liquid stools can pass The fresh spots of the stricturing process are to be found at the cranial ends because the ulcer continues to climb upwards Examining with the rectoscope in a rather early phase, we can see a sort of hypertrophy as crest shaped eminences and protuberances accompanying a not intense stricture of the rectum originating probably from an elephantiastic process of the pararectal tissue, further there can be seen many reddish superficial or corrosive ulcers small as lentils in the vicinity of this formation, irregularly arranged Probably the ulcers change afterwards into the above mentioned, discoloured and grey furred lenticular ulcers, confluing and forming thus in a slow process the greatly extended surface of the ulcer, whereas the chronic œdema in the vicinity produces slowly shrivelling connective tissue, this being—together with the shrinking cicatrizant process—the cause of the very considerable stricture of the rectum

As said above, this stricture of the rectum needs not always accompany the above mentioned illness Whilst in most cases in which the strictures of the rectum are accompanying the described illness of the vulva, the clinical marks especially of the solitary ulcer in vulva and rectum are showing many resemblances to each other (fur, very slow progression first at the surface, later on in the depth, form of the margin and of the bottom, a s o) and also the histological pictures make us think of the similar genesis of both diseases(*b*), there are cases, in which the accompanying stricture of the rectum results from other causes We shall speak of this later We only want to mention here the *thin* mucus, which is generally characteristic, for the tuberculous ulcus cannot be considered in the cases of rectal stricture as a means for differential diagnoses, for the above mentioned stenosis regularly establishes *itself, in case of a longer lasting illness, a collateral inflammation* or catarrhal state of the lower sigma caused by the hindrance in the passage stowing the fæcal putrified contents This inflammation, a sort of self help of nature in order to allow the passing of the fæces, produces in later periods of the illness a greyish pituit, mixing itself with the liquid stool and covering sometimes the ulcus If the stenosis is of a higher degree, the process in the sigma can progress and lead to an abscess of the pararectal tissue and to the formation of a

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(*a*) The kind of this coat is a co argument that the ulcer is not a syphilitic one, because such an ulcus shows as a rule, only little discoloured fur or only a grey reddish pituit [*cf* the cases of Strauss(5)] Also the little scent of the fur on luetic ulcus of the rectum stands in opposition to the frequently badly smelling pituit of the ulcer in question About the syphilitic structure of the rectum, Drueck(6) has written a very interesting paper with pictures of X rays

(*b*) It is always the same picture of the infiltrated tissue with unspecific granulation like the tissue in the bordering parts of an ulcus cruris s l

amenorrhœa; no wonder, for we all know, that fistulæ vesico-vaginales of longer duration show, as a rule, amenorrhœa—reason still unknown. The commissura posterior and the end of the labia minora are almost in all cases destroyed and, sometimes, there are one or several small ulcers irregularly bordered and with a dirty yellow fur. From the fossa navicularis vaginæ or its former place, respectively from the nearest vicinity originates one or more smaller or larger fistulæ. If the fossa navicularis is intact, their opening is to be found regularly at the fossa navicularis or in its anterior part. These fistulæ pierce the paravaginal tissue undermining the vagina for longer distances in more or less parallel course to the vaginal wall, and changing their direction they finally pierce the rectum(*a*). Sometimes they spread in several branches. In the environs of the anus, hidden between the radiant folds of the anus, there can be very often found an ulcerated spot of the above described kind. By distending and withdrawing these plicæ one can often see an unexpected extension of the ulcer, a fact which already Tomaczewski has noted in his study concerning the ulcus molle(*b*). Very often, but not always, the rectum shows in these cases a deeply sitting, severe stricture beginning as a rule about 4 cm. above the anus(*c*). The physiognomy of the anus in these cases often points, with a certain degree of security, to this inner stenosis (*see* Plate XLIV, fig. 2). The pars analis recti shows a sort of relaxing and the sphincter paresis sometimes allows the mucous membrane of the pars analis to become visible, though only to a very small extent. In a more progressed illness also the colour of the mucous membrane of the anus is characteristic. It has, just like the noduli hemorrhoidales coming out from the anus in a characteristic way, a paler colour than would be expected because of the fresh stowing; the consistence of the noduli hemorrhoidales is that of a rather hard œdema(*d*). The stricture of the rectum, as said, has two principal characteristics as Tillaux(4) has described.

(1) It sits very deep in the lower part of the rectum beginning about 3-4 cm. above the anus and from there it can reach upwards very far(*e*).

(*a*) More rarely these fistulæ take their course in a lateral way and come out where the exterior skin goes over in the mucous membrane of the vagina, or still more laterally piercing the skin.

(*b*) Tomaczewski(2) notes that an ulcus molle in his localization when spreading, as a rule, does not encroach upon the sphincter.

(*c*) The forming of a rectal stricture is possible without pre-existence of a fistula recto-vaginalis, a circumstance which Bruhns(3) has already observed.

(*d*) The relaxing of the sphincter is perhaps due to the same reflex which at the normal stool causes the opening of the pars perinealis recti, normally this is effected by filling the ampulla recti with fæces, the pressure is the efficient factor for the beginning of the reflex. If, therefore, a stenosis causes a chronic impaction of fæces above itself, this forms the same and lasting causal factor for the reflex of relaxation. Whether this, as it were, stationary reflex is to be assumed as a set peristaltic movement (i.e., that the reflex acts and goes on only in the ganglion cells of the rectal wall or whether the reflex passes the spinal cord, or whether both possibilities are given, is to be decided still. I think that the reflex might pass the spinal cord as it seems through the posterior radix, because in the metalues, tabes, often a relaxing of the sphincter occurs after an irritation in the beginning which leads to mistaking it for the consequences of fissura ani). Drueck (l.c.) says that this sphincter paresis is a very early symptom.

(*e*) Only the dysenteric ulcera and strictures seem to climb upwards still higher.

Near the former opening of the urethra there could be seen a small painful ulcus as large as a lentil, of a dirty greyish green colour, surrounded by cicatrical tissue The urethra itself was at its side as it were, slit and ' laterally drawn ' The left labium minus was fringed and the probe could easily pierce its former middle appendage Two scars at the upper end of the labium and the commissura posterior marked the spot of the former ulcus The patient had originally come to the hospital with some ulcera mollia part of which had healed, but on the place of the one the mentioned large ulcus had formed, which showed clear clinical marks and also the bacteriological statement of an ulcus tropicum (*Spirochæta refringens* and bacilli in the form of a spindle) In the streak preparation were further pseudo diphtheria bacilli There was also a recto vaginal fistula which ended in the fossa navicularis, forked in two lines It appeared in the rectum above the pars sphincterica The two mouths of the fistula showed borders which looked frayed and which emits abundant pus In the rectum there is above the mouth of the fistula a bulging which is especially pregnant at the anterior rectal wall and we recognize two parts roll shaped, one above the other between which lies a dirty oval ulcus covered with pus presenting the clear view of a chronic torpid ulceration The ulcus is about 4 cm long that is perhaps the initial stage of a stricture At least in this case it is probable that this young stricture can have formed—compared with the age of the ulcus molle—after the ulcus tropicum had formed out of the ulcus molle and the connective tissue respectively the lymphatic vessels and veins had been changed in the sense of lymphatic œdem

In the third case from within the furrow which separates the inner side of the little left labium from the vestibulum, there extends a rather irregularly bordered loss of substance, about the size of two beans, the basis of which is tolerably level and the edge sharply marked The ulcer is coated with a discoloured fur, and its environs show a peculiarly hard œdematous swelling The level of the urethra itself is sunken in, the ulcer having corroded part of the urethra, which looks therefore destroyed from the side view There are cicatrical tissues in the environs and the frontal vaginal wall shows a prolapsus, in its upper end detached urethral swelling The left great labium and especially the little labium are altered in the line of a chronic indured elephantiasis On the posterior circumference of the vulva, in the fossa navicularis to the right, there is a little (about the size of two peas) bed of ulcer with a dirty suppurating coat its edge is a little overhanging and issuing from it The sound enters a little space in an oblique direction backward up, through the middle, without being able to penetrate into the rectum (fistula vestibulo rectalis incompl) The rectum itself is only slightly altered Nevertheless, there is to be found in the frontal wall of it in the height of 4 cm a place which is a little harder and expands over half the periphery of the rectum, being about 2—2½ cm broad and protruding into the cavum recti with a somewhat irregular surface, which is covered by mucous membrane (rectoscope) Perhaps that is the beginning of a stricture The streak-preparation of the ulcus on the urethra shows heaps of spirochæta of the type described by von Prowazeck as *Spirochæta refringens* (Schaudinn) and less of the fusiform bacilli, the streak-*preparation of the little fistulous ulcer exhibits an unspecific flora A light gram positive vibrio (a)*, pseudo diphtheria bacilli, and the picture is particularly abundant in spirilla of the type of spirilla balantitidis Ducreys' bacilli have not been found

The histological examination of old cases, the stream of chronical ulcera did not yield any special bacilli Sometimes from the anamnesis, the kind of fringed environs (*see* Plate XLIV, fig 3) of the scars on the vulva and in inguine (according to Bubonen) and the sort of fistulæ there could be concluded that the ulcus molle had been there before The histological pictures show all a resemblance with the well known pictures of an ulcerous process with unspecific granulation as we know it from the ulcus cruris There is new granulated tissue with partly rather thick-walled generally dilated vessels to be found and coats of lymph and plasma cells around those vessels The plasma cells augment in some cases going in to the depth Especially the enlarged lymphatic vessels and veins surrounded by the

(a) *Cf* the vibrio of Scherber at the balanitis circinata erosiva.

(secondary)(*a*) fistula which can open in the vagina, where the connective tissue between rectum and vagina has its thinnest spot. These fistulæ are not so rare, as those opening in the fornix.

In order to understand the genesis of the whole disease, it is of course necessary, to study cases in their beginning. I had occasion to observe four cases of rather fresh ulcera of the vulva, two of them by the amiability of Dr. Sutomo, Chief of the Dermatological Department at the C. B. Z. in Soerabaya. A fourth case, which was little progressed at the vulva, showed in the rectum the fresh affection we have mentioned.

Three ulcera offered the *typical picture of an ulcus tropicum in an uncommon localization.* The first of those two cases showed still clearly remaining signs of the origin of this ulcus tropicum vulvæ on the bottom of the preceeding ulcus molle; these signs could be remarked at the ulcers as well as in their fringed environs.

In the first case the inner part of the left small labia was almost quite occupied by an ulcus. Stripping off the fibrinous putrid badly-smelling fur, we can see the ground of dark red colour with a few small granulations. The border is somewhat higher, flatly descending, not undermined and not corroded. The ground is rather sensitive at touch. A rather hard œdema of a livid red occupied the labium minus, also the labium minus is œdematous. There was also a small ulcus near the anus at the left side between the plicæ, size of a halfpenny. This ulcus showed a slightly undermined border and much pus. The streak preparation showed streptococcus, gram negative diplococcus at one part still the bacilli of Ducrey, but before all a big number of spirilla of the type of the *Spirochæta refringens* and *Bacilli fusiformi.* In the culture grew streptococcus and (pseudo ?) diphtheria bacilli(*b*). The histological examination showed young granulated tissue and a great number of lymph and plasma cells, especially accompanying the enlarged veins and lymphatic vessels. A section coloured according to the method of Levaditi yielded spirochætes arranged in nets, but only at the highest surface, above the inflamed stratum of vessels. No stricture at the rectum.

In a second case (6 months old) there was found at the inner part of the small labium going over into the fossa navicularis an oval, sharply-bordered, flat and badly-smelling furred ulcus (longitudinal diameter about 3 cm.), in the environs of which the same, indurated red-brownish œdema as above could be touched. Ground of the ulcer at touch moderately sensitive, the border was not undermined.

(*a*) Contrary to the primary fistulæ which have formed before stricture. Secondary fistulæ can also, of course, open outwards, quite low down at the commissura posterior of the vulva. We have seen this at a bacillary dysenteric stricture of the rectum (preparation of the pathological Anatomical Institute in Vienna) and a second time at an extended stricture of the rectum. The sigma, in its lower part: this structure is supposed to be of dysenteric kind. The latter stricture had formed by an unknown cause, beginning with an attack of high fever in a virgin of 16 years and after 3 years of all sorts of treatments the stricture reached up to a height of 15 cm. above the levator slit, allowing a bougie of 16 to pass. The patient was incontinent, twice pararectal fistulæ had formed and were healed with coarse scars. The recto-vaginal fistulae could not be closed. At last an anus præternaturalis had to be made.

(*b*) The differentiation by fostering soils of Riemsdyk (pepton, 1 per cent, litmus tincture, 60 per cent, glucose, 1 per cent) and agar-cultures where the bacilli grew richly in the deeper part of the sting, spoke for the fact of true bacilli of diphtheria. But it is well known, that also *very frequently* there are pseudo-diphtheria-bacilli in the secretion of the vulva without calling forth any pathological phenomena.

Zeissl, Stein and others have pointed out the frequent symbiosis of pseudo-diphtheria-bacilli with the strepto-bacillus of Ducrey.

Scars(*a*), especially after the extirpation of the inguinal glands [Riedel Andry and Dalous,(10) Koch(*b*)] traumata, alterations of the lymph and blood vessels, have been marked as important for the origin of the disease Leinert(12) has assigned the principal pathognomic part in the ætiology to lues, rare instances only he attributed to tubercular infection

The resemblance with ulcus cruris, the origin of which cannot be imputed to special bacteria, Ristic and Zieler(*c*) pointed out again Veit(14) gives a good description and some illustrations, and an excellent survey of literature [*Cf* further Bamberg(15), Schade(16), and Linnert(17)] The chapter of Walthard(18) does not bring many new things

Buquicchio Antonio(19) proves the ætiological importance of elephantiasis vulvæ and removal of inguinal glands (primary ¹) for the origin of ulcus vulvæ chronicum and affirms that tubercular lues, ulcus molle and spirotrichosis are to be excluded from the diagnosis Scherber(20) writes in his monograph on balanitis in Jadasson's Handbuch, that, according to his observations, the elephantiasis *precedes* the formation of the ulcus Fabry(21) on the other side thinks the elephantiasis secondary and the ulceration primary, and in his opinion the ulcer, with the complication of erysipelas and erysipeloid subsequent outbursts, lead to chronic œdemata and elephantiasis But he also admits the possibility of the opposite course Immediately related to our theme is also Spillmann's(22) observation of an ulcus gangrenosum of fusospirillaic nature between vulva and buttocks

Concerning the accompanying stricture of the rectum, there exist many works in the literature, which are treating the stricture alone as a separate illness and are speaking in general about it The last time Roegholt(23) wrote a paper on the stricture of the rectum based on his experiences in Dutch East India, these are, or most of them, the very strictures which form part of the ' esthiomene ' He tries to prove therein that the ulcus molle is the cause of all those strictures of the rectum, an opinion which has been uttered already by physicians of the nineteenth century See the complete literature in Juliusburger(24) The ætiological interpretation of the stricture of the rectum, which inclined years ago generally to a luetic(*d*) genesis, has been limited very much by Sourdille and, after the

(*a*) Therefore, it appears there were many more ulcera chronica vulvæ in the operative era

(*b*) F Koch(11) was the first who called the affection ' ulcus chronicum elephantiastic ' and points out that in some cases the absence suppuration or extirpation of the lymph glands in the inguinal region with following lymphstasis is of great ætiologic importance

(*c*) Ristic and Zeiler(13), here we also find the true observation, that a transition of this kind of ulcer into the vaginal mucous membrane, as it is with tubercular ulcera, has not been observed

(*d*) Carre(25) (*he found among 266 cases, 210 women*), see also *Quénu* and Hartmann, Rieder (1897), Ruge and Benda Rieder tried to give an explanation for the fact, that the stricture occurs much more frequently in women, pointing out to the junction between the venæ vulvo vaginales and the veins of the rectum See the fine paper of Drueck(6) 'Syphilis of the anus and rectum' (l c) and the good monograph of Montague, J l (26) who found that the true gumma leads more rarely to a stricture but more frequently the syphilis ano rectalis, Fournier Hartmann(27) negates the essential part of syphilis in the originating rectum stricture Among 258 patients of the Mayo clinic between 1912 and 1922 only the fifth part showed rather certain signs of lues Buie Louis(28), Sutejew(29) Also see the excellent paper of Bensaude(30)

mentioned infiltration of cells in the nearest environs of the ulceration are remarkable. In the latter clots are to be seen in some places as signs of endophlebitis. The characteristic infiltrates of small cells with young connective tissue partly already formed in lines, the vessels not being altered lubrically, form a remarkable difference to any other formation of scars, also to that on the ulcus cruris. This is a reference to the shifting of the pathogenesis of which we shall speak later on. The histological and bacteriological examination of the ulcera in those older cases did nowhere result in the discovery of a specific exciter.

Surveying the above-drawn form of disease the homogenousness with Huguier's 'Esthiomène ou darte rongeant de la région vulvo-anale' strikes us (Huguier, 1848)(7). Studying the description and conception of all cases known of this rare disease since its discovery (1848), examining at the same time what ætiological points of view are known, a remarkable resemblance with the tropical disease results, in fact. The esthiomène has become very rare in Europe, particularly since the abandoning of the operative methods in extirpating the inguinal glands, and if we denote it to-day as ' ulcus chronicum vulvæ et ani (elephantiasticum), it has only changed the name since the days of its discovery, whereas there is very little progress made as far as its origin, therapeutics, a.s.o., are concerned. One has little to add to the conclusions with which Brau(8) sums up his researches. These conclusions were the following:

(1) There is a chronic affection of the vulva, at first ulcerous, combined with elephantiasis in the long run, which is neither cancer nor syphilis nor tuberculous ulceration.

(2) It is no question of lupus, although it has been maintained by the majority.

(3) The affection arises in most cases in consequence of a soft chancre, or more rarely, of a wound, after a lesion of the tissues, which are deteriorated by repeated pregnancy, varicose veins of the vulva, excesses of every kind or abuse of alcohol.

(4) This virulence of the soft chancre soon disappears; one sees then a chronic and, through want of cleanliness, preserved ulcer.

(5) This region becomes the seat of repeated inflammatory and lymphatic outbursts which cause a chronic hypertrophy in the most advanced cases.

(6) One can reduce this affection, which offers quite an analogy with the varicose abscesses of the legs, to two forms, which represent different stages of illness: to an ulcerous and an ulcero-hypertrophic form.

Szász(9) suitably distinguished a *genital and a rectal type* of the disease according to the participation. He assumes, with Lassar, Koch and Jadasson, that the elephantiastic hypertrophy is to be attributed to 'a reciprocal effect between periphrastic inflammation and negative or insufficient function of the lymph glands,' and points out, that in some cases, lues with its alterations of lymph and vessels is of a prominent ætiological importance.

Surveying the various observations about the rectal strictures made by others and by us, we must say that the stricture of the rectum certainly does not take its origin from a uniform cause that its various ætiology variegates its beginning, whereas its last consequence is an unspecific and diversified one The fact that the stenosis recti is due to different ætiological facts is also the modern opinion as (f i) Lesk pleads as well as Reichle Tietze(34) But how it may be in its particularity is quite unknown till now ' Terra incognita encore le retrecissement rectal ' (Tissau)(35) [*Cf*, also the publication ' Les Rectides stenosants ' par Delbet et Mouchet(36)]

Concerning the stricture of the rectum which is interesting us specially here, i e , the stricture accompanying frequently the illness of the vulva there is to be stated first, if it is in fact *one illness* on both localizations or if the simultaneous disease in the rectum does not represent perhaps an occasional meeting only and is not a uniform illness together with that of the vulva The first circumstance can, of course, happen occasionally But in the greater number of cases the resemblance of the histological picture of the torpid small ulcerations, the great resemblance of the fur and the irresistibly creeping kind of progression as well as the fact that these ulcera exist simultaneously which, with their consequences, further the preference for ground of connective tissue with congestion in veins, with vascular and lymph engorgement which produces elephantiasis– shortly the whole aspect speaks for the same genesis , so also does of course the only statistic of the frequent simultaneous existence of both localizations (vulva and rectum)

On behalf of the ætiology we can state that not a small part of this sort of strictures show any connection with a preceeding ulcus molle This opinion, that the genesis of the rectum stricture is based on a soft chancre has also kept its place in the literature to this day in little hints and observations since Despres(*a*) Tomaczewsky, Gosselin(37), Bra i(8) a s o Thus one finds in the manual of Strumpell, Matthes(38), Cornil and Ranvier(39), in the works of Rotter(40), Drueck(41) respective observations, and in the monograph of Roegholt, where he quotes remarkable reasons also for tropical strictures, this opinion is corroborated Though this genesis seems most probable in not a small number of cases, we must say expressly—according to all experiences—that the stricture of the rectum has no uniform genesis, nor does the ulcus molle in the rectum lead in every case to a stricture(*b*) , never does it so alone

Roegholt's supposition, that the ulcus molle is the only cause of the stricture, must therefore, as we think, be completed to a large and essential extent Already in the discussion to the conference of Roegholt, the physicians Dr Bakker, Dr Olivier and Dr de Vrieze have asked if there could not be perhaps a second

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(*a*) ' A Desprès la considerait comme produite par la cicatrice d'un chancre phagédénique ' Tillaux, 1 c

(*b*) On the contrary frequently ulcera mollia are seen in the rectum which do not lead to any strictures nor considerable alterations

contradictions of Ponfick (Breslau 1884), it had been altered in a way, that all strictures of the rectum were supposed to have their cause in gonorrhœa(*a*).

The tuberculous stricture (Péan and Malassez and others) has also been verified without doubt by histological investigation and by tests on the guinea-pigs (*b*).

The dysenteric (bacillary and amœboidal) origin of the rectum-stricture has been completely secured, Garsaux (1877)(32), since the researches of Kümmel, Körte (Ruge) and Poelchen(33).

Not absolutely proving are, in the clinical and histological pictures, the differential diagnostic marks(*c*) of the luetical and gonorrhœical stenosis of the rectum, especially in advanced cases. The statement of the *obliterated smallest* vessels, of veins and especially of the smallest *arteries*, a considerable round-cell infiltration around those vessels, contrary to tuberculosis, *the form of necrose* and before all the *maintained elasticity* give, it is true, a great *probability to a luetic genesis*. The same is the case with the specific infiltration of plasma cells, which, with a certain degree of security, can point to a gonorrhœa. But in those advanced cases, the differences are blotted out, a cicatrical tissue, the origin of which cannot be guessed, appears and the ulcera show a rather unspecific character. Nevertheless the origin of the stricture based on a luetical or gonorrhœical infection is sure, only probably not in the measure as has been supposed until now. It is no doubt, that there are also *a priori* unspecific strictures of the rectum originating from a stercoral ulcus from a proctitis, respectively, sigmoiditis erosiva, granulosa or ulcerosa chronica. That processes of retention at the sinus Morgagni can favour the formation of rectal ulcera and their consequences is a fact, which also Strauss (1. c.)(5) has stated.

(*a*) Ponfick, Mikulicz, König and others. Mikulicz has published 18 cases of his clinic. König believes most strictures to be gonorrhœical ones. Beer has seen among 700 cases only one with a stricture.

(*b*) *See* also Gougerot, H.(31).

(*c*) Purely clinically, *from the height in which they sit*, the strictures *cannot be distinguished*, according to our experiences and contrary to frequent supposition. Occasionally, especially at the initial phase, the form of the ulcers gives information, thus at the tuberculous strictures the characteristic form and blue colour of the border, eventually small knots in the vicinity, point out to this genesis ; in later phases of the tuberculous strictures there is often to be found a stricture in form of a narrow ribbon (Hochenegg). The bacillary dysenteric ulcers which are reaching most highly (*cf.*, the above-mentioned case) frequently form a net-like stricture, so that there are lying sometimes small isles of normal mucous membrane between lines of scars in reach of the ill parts. In the initial phase the position of those ulcera reminds often of rope-ladders (arrangement according to the transverse folds of the rectum). The dysenteric stricture is sitting generally higher, at the beginning of the sigma, to assist its diagnosis as dysenteric, one sees frequently another localization of the same illness in the intestines, especially a dysenteric ulcus in the low ileum. The favourite place of tuberculosis of the colon is supposed by many authors to be the colon ascendens and cæcum, whereas the lues of the large intestine is said to prefer the rectum. Not at all sure are the clinical marks given till now for luetical and gonorrhœical strictures, e. g., that the gonorrhœical stricture always is sitting about one finger's height above the anus.

Roegholt has considered and affirmed the possibility, that an ulcus molle can originate in the rectum through a regurgitation in the lymph tracts between the inguinal glands and the rectum by a protraction of Ducrey's bacillus in this way into the rectum This possibility is there, it is true, but the protraction of the bacillus of Ducrey with respect to the accompanying parasites stands still in the pararectal tissue and leads yet to the same effect of a stricture The cases without a primary recto vaginal fistula can take their origin in this way or naturally through flowing over The finished picture of the stricture of rectum and the accompanying not healing ulcera in the rectum at the tropical esthiomene is *in any case the unspecific product of the very characteristic alteration of the tissue* which took its origin with the invasion of specific primary and secondary germs The pathological condition of the surrounding tissue effects that out of every smallest and slightest loss of substance grows a progressing ulcer and this produces an extended cicatrization, so that the circulus vitiosus continually promotes the illness

Having thus uttered some critical points of view of our own about the rectum stricture, we pass on to the proper ulcus vulvæ chronicum and in trying to form a picture of its pathogenesis and progress we may say the following the disease differs in a certain degree from the rare European picture of illness by the larger participation and destruction of the fore half of the vulva, especially the urethral region The European form of illness, also if it seizes the urethra it does so very rarely in the extent as the tropical esthiomene rather as Stoeckel says ' Sie fuhrt zur Bildung von Strikturen und Fisteln, besonders nach dem Rectum hin ' It is probable that the disease begins preferably with an ulcus on the fossa navicularis or somewhere near the urethra, this ulcus often is an ulcus molle But, the described largest devastations cannot be effected by a simple ulcus molle Some other circumstances must be added At all events the bacillus of Ducrey alone is not sufficient to explain the serious alterations in the connective tissue It is known that a soft chancre likes to harbour on its base *Spirochæta refringens* and *Bacillus fusiformis* as parasites, which are considered in their symbiosis the exciters of the ulcus tropicum It is very likely that some of these ulcera mollia become an ulcus tropicum vulvæ through the proliferation of those which are in the beginning only accessory parasites It then alters its ulcerous character completely out of a gnawed at ulcus with uneven ground and thick uneven putrid fur to a rather steeply descending, rather even grounded, not much granulated ulcer But also, though more rarely, on every unspecific or specific abscess in those places of predilection, the mentioned symbiosis of the ulcus tropicum can set up and effects that the ulcer corrodes into the depth The fact that the ulcus tropicum does not occur rarely in this place, is also proved by the fine publications of Pattiradjawane(41), where three cases of ulcus vulvæ tropicum are described(a) It is possible that also the coexistence of diphtheria or

(a) Kayser(15) saw a case of ulcus tropicum of the penis

infection. De Vrieze put the question, if it could not be perhaps the Plaut-Vincen infection of phagedænical ulcera and if there had been already made the relativ researches, upon which question Roegholt gave a negative answer. *In fact, on can prove such a secondary infection with bacilli of Plaut-Vincent*, if one has th occasion of examining earlier phases of illness (*see* the above-mentioned cases It is further well known, that the *Bacillus fusiformis* as well as the *Spirochæt refringens* grow as parasites with preference on the soil of an ulcus moll [Citron(42), Stein and others]. The bacillus Ducrey, as shown by the necessit for blood-agar on which it lives and which the exciter changes in its specifi way, prefers this parasitical dwelling as it also likes to have frequently th pseudo-diphtheritic bacillus as partner. *Perhaps we find here the reason wh the very ulcus molle likes to get phagedænical* as many authors have stated 'Het ulcus molle heft neiging om serpigeneus of phagedænisch to worden, Roegholt(23). The ulcus molle alone can, as said before, scarcely be the caus of a stricture of the rectum. We have seen often in Europe ulcera mollia in th rectum but very rarely a stricture of the rectum afterwards. It is probably the mixing infection only which leads—with the great augmenting of spirochætes—especially to becoming the ulcer 'phagedænical'(*a*). Also, if the streptobacillus of Ducrey has a special preference for the lymph spaces and slits of the tissue and the lymphatic vessels (bubos, a.s.o.), the high degree of elephantiasis as well as the preceding alterations in the tissue could not be explained by it alone, especially as the virulence of this exciter, which at the beginning is enormous—think of the inflammatory infiltrate reaching quite at the beginning far into the environs—extinguishes very soon(*b*) and wants perhaps this mixing infection for its maintenance. The higher degree of the 'lymphatic œdem' (Virchow) which results in the pararectal tissue and has an important part at the origin of the stricture, can thus be explained, that the stricture of the rectum is less a scar-stricture on the ground of a former ulcus molle, but *a shrinking of the elephantiastical pararectal tissue on the way of a chronic œdem, which has produced a new formation of connective tissue, the latter having by its shrivelling caused the stricture. Only secondary—favoured in its origin by the stowing of circulation—then are coming out the numerous, small unspecific ulcera of the rectum, which in later phases of the illness are always found in the reach of the stricture. It is therefore a question, if at all, an ulcerous process of the mucous membrane in the rectum has to precede the stricture in our cases, in other words, if the ulcus molle has to precede the primary stricture in the rectum.* In his conference,

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(*a*) Between phagedænical and gangrenous ulcer there exists probably only an arbitrary difference in so far as the 'phagedæn' is the expression for a specially vehement process of destruction seizing quickly large districts especially on the surface, whilst 'gangren' marks only *the fact* of a necrotization, may it be circumscribed or not.

(*b*) The bacilli Ducrey in the border-parts of an ulcus molle are, as a *rule, of little virulence*; the sharp limit of the ulcus, the sudden ceasing of the epithelium, a.s.o., are signs that the organism in this zone has mastered already the exciter [*see* Kyrle(43)].

often the end The process, which probably might have been stopped at the beginning, shows in its more developed state the very irresistibility of all its phenomena, as their characteristic symptom As another very important symptom for the differential diagnosis we mention the coexistence of the different earlier and later forms and states of the disease, a third is the accompanying mark elephantiasis, i e, the kind of œdema and its dependance on the above mentioned two principal localizations (anterior part of the vulva and lower part of the rectum)

Saying finally some words on therapeutics we remark beforehand, that an operative procedure is possible only when the process has come so far to a stoppage, that it does not infect the wound caused by operation in a secondary way An artificial stopping and cleaning of the ulcera at least in this part of the illness, which is localized on the urethral part of the vulva, can be obtained in many cases by cauterizing the small ulcerous places(*a*) At all events a Paquilinization has to be made before any plastic operation

The therapeutics of the accompanying infection of the rectum do not belong to the region of gynæcology, being a purely surgical matter

The gynæcological treatment of the incontinence of urine in those cases(*b*) is, of course, an operative one only and, according to our opinion, the most fit method seems to be a plastic operation of the sphincter urethræ, which uses the levator ani All other methods, thus as simple angular distortion of the urethra, giving it the shape of a Y, by suturing the ends of the slit at the os pubis accompanied by a posterior colporrhaphia and plastic of the pelvic floor(*c*), the torsion of the urethra (Gersuny)(*d*) if the urethra is still there, the interposition and suturing of the cervix into the slit of the levator (Rubsamen) can— as will be understood easily—lead to a success only in a small number of cases, that is, only in those cases where the sphincter has not been completely destroyed A plastic of the muscles is in any case more promising than that of the connective tissue Still more promising is therefore the operation according to Gobbel Stockel, which is using the turned musculi phramidales as a new sphincter, but this method too is frequently not sufficient in those cases and has further the disadvantage that one must operate per laparatomiam and per vaginam, thus instead of two laparatomies a third one becomes necessary Further the levator ani as a muscle of the pelvic floor is kindred through innervation and function more to the sphincter than the musculi pyramidales This operation of incontinence and formation of the

(*a*) In a rather acute phase of this illness with a grave putrid infection from the labium majus reaching to the inguinal region Lesk obtained a stoppage by multiple radiant incisions, excisions of the necrotic tissue and application of iodoform gauze

(*b*) We are speaking here always of the older phases of the illness, where the specific process has faded away and the mentioned small secondary chronic ulcera are sitting on a rather coarse granu lation and scar tissue

(*c*) A posterior perinoplastic should be made after all such like operations of the urethra as a second help

(*d*) *See* also Eastman(46)

pseudo-diphtheria bacilli which is often observed, figures in it(*a*). The pronounced preference of the ulcus for connective tissue is shown by the fact that the ulcus, leaving intact the vagina, deepens in the environs of the urethra and before the fossa navicularis, spreading out in the paravaginal, paravenial and pararectal tissue, and further by the predilection for places particularly rich in veins (corpora cavernosa, veins of the commissura posterior, which discharge into these and the veins of the rectum, veins of the sinus Morgagni) physiologically subject to engorgements. The elephantiastic accompanying conditions clearly point to an ulcerous process, similar to that which appears so often on the leg in the region of the particularly obstructed veins above the ankle. To produce on the vulva the rather violent and permanent vascular stasis and obstruction, which we find de natura on the leg, needs a primary process and as such we may consider the ulcus vulvæ phagedænicum, or the ulcus vulvæ tropicum alone. That this form of illness appears especially in prostitutes, where there are frequent obstructions and through it alterations in the vessels, caused by mechanical means, supports our conception. It is easily to be understood that the want of cleanliness and the neglect of the wounds occurring with these women offers favourable, and perhaps necessary, conditions for the progress of the disease. The scars remaining after the primary ulcera in these women, either specific or unspecific, are likely to give also occasion for little obstructions, and therefore establishments of a secondary ulcus. They are less important as a place of entry for the infection. The scars in inguine remaining after a purulent or extirpated bubo cause obstruction of the lymph tracts and block up a part of the lymphatic vessels, promoting thus the elephantiastic alteration of the tissue. Also by the fact that the esthiomène was observed in Europe so much oftener in the operative era, the correctness of our argumentation can be corroborated. In the elephantiastically altered tissue many non-pathogenic exciters can produce a chronic, unspecific inflammation, the *normal intestinal flora* penetrating into the pararectal tissue can excite the gravest paraproctitis, *and germs, normally non-pathogenic, can complete* the process of destruction in the periurethral tissue, begun by the primary ulcus, until the urethra is totally ruined. Then ensues a kind of purging of the ulcus, by the beginning incontinentia urinæ, but this effect is not lasting, because the urine, anti-bacterial in one way, leads to secondary infection and formation of fresh ulcera through the stagnation in the above-mentioned mould. It is a fact that the process in the anterior part of the vulva is sooner stopped than the process in the rectum which, going on irresistibly, affects more and more parts of the intestine towards the sigma, producing always bigger alterations in the depth of the tissue and in the vessels, until it finally sets in with the formation of trombuses on the large veins of the abdomen and leads to ascites, an accompanying peritonitis bringing

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(*a*) Bacilli of diphtheria or pseudo-diphtheria are to be found rather frequently on the normal vulva as non-pathogenic germs.

Watkins(55) have used mucous membrane of the vagina to cover a defect of the bladder and were successful, this points to the fact that the mucous membrane of vagina can be used as a substitute for the mucous membrane of the urethra

REFERENCES

(1) BOERMA (1926) — Geneeskundig Tydschrift voor Nederlandsch Indie Deel 66, aft 2, p 278 Discussion

(2) TOMACZEWSKI (1903) — *Ztschr f Hyg* 42

(3) BRUHNS — Riecke, H buch der Geschlechtskrankheiten

(4) TILLAUX — Traite d anatomie topographique avec applications a la chirurgie

(5) STRAUSS (1910) — Procto Sigmoscopie, Thieme

(6) DRUECK C (1925) — *Ch Med Journ a record* Bd 121, No 4

(7) HUGUIER (1848) — Memoires sur l Esthiomene ou dartre rongeant de la region vulvo anale Men de l ac de med

(8) BRAU (1894) — Nouveaux essays sur l Esthiomene These de Bordeaux *Arch f Dermatol u Syph* Bd 36 p 270

(9) SZASZ (1903) — Ueber Esthiomene *Monatsschrft f Geb u Gyn* XVII

(10) ANDRY and DALOUS (1903) — Esthiomene anorecto vulvaire et lymphang *Journ des malad cut et syph* p 86

(11) KOCH F (1896) — *Ztschr f Geb u Gyn* XXXIV 327 and *Arch f Derm u Syph* Bd 34 Hft 2

(12) LEINERT (1919) — Klinische, patholog u anatom Untersuchungen uber eine seltene Form von chronischer Ulceration der Vulva und ihre Heilungs prozesse *Arch f Hyg Zw* 111 S 508

(13) RISTIC and ZEILER (1921) — Ulcus vulvæ chronicum sclerosum *Lijecnicki Vjesnick Jg* 43 No 4 ref *Zentralblatt f Haut u Geschlechtskrankheiten* Bd IV, p 477

(14) VEIT (1898) — Handbuch d Geb u Gyn von Winckel

(15) BAMBERG (1902) — *Arch f Gyn* Bd 67

(16) SCHADT (1920) — *Monatsschrift f Geb u Gyn* Bd 51

(17) LINNERT (1919) — *Arch f Gyn* Bd 11

(18) WALTHARD (1927) — Halban Seitz

(19) BUQUICCHIO ANTONIO (1925) — Contributo di recerche sulle ulceratione chroniche non venere ai genitali esterni feminili *Giorn Ital dei malatt vener e di pelle* Vol 65 1, 3

(20) SCHERBER (1927) — Jadasson s Handbuch d Haut u Geschlechtskrankh XXI, p 384

(21) FABRY (1927) — *Ibid* XXI, p 491

(22) SPILLMANN (1924) — Gangrene spontanee genitale et serum anti gangren ense *Bull d la Soc Franc d dermatol Arch Syph Jg*, No 5 pp 13—15

(23) ROEGHOLT (1926) — *Geneeskundig Tydschrift voor Nederlandsch Indie*, Deel 66 aft 2

(24) JULIUSBURGER (1848) — Beitrage zur Kenntnis von Geschwuren und Strukturendes Masdarms, Inaug Dass Breslau

(25) CARRE (1892 93) — Du retrecissement dit syphilitique de rectum p 278 These de Paris

(26) MONTAGUE, J F — Rectal pathology caused by syphilis, *Amer Journ of Syphilis*, Vol X, No. 2, p 254

ıcter with the help of the levator ani has been indicated for the first time by 'ranz(47). He prepared, from an anterior kolpotomy to the left and the right rmining the vagina, the anterior parts of the levator ani and cut in the pars ɔa of the levator, 3–4 cm. beneath its insertion at the os pubis, a bundle of the ıor in the thickness of a pencil, then he joined those two with its free bundles ıscles lying below in the median plain beneath the urethra. This new sphincter sutured with one thread of catgut each behind and before to the bladder near eptum vesico-vaginalis. The closing of the urethra thus obtained is approach- ıore the physiological process, as we know since the researches of Kalischer(48) Zangemeister(49) that the physiological closing of the urethra, at least not that ıe sphincter internus cannot be effected by an anular contraction, but by a of lifting, i.e., a bending of the urethra caused by a bow-arrangement of the ıcter internus around the posterior wall of the urethra. If we consider that evator ani on the rectum effects, according to the latest researches, a similar ng, a plastic with these very fibres shortened correspondently, must be obvious. ;hus do but ask of this muscle its physiological function with a changed in- ɔn-place. But we would suggest that the bundles of the pars pubica dissected ıould not be joined in the median part alone as Franz does, but they should be ɔff to about 6 cm. and then be sutured crossing each other in the region of the ıbis, joining the bundles of muscles at the crossing place with two threads of ıt and uniting them at the same time with the bladder near the septum recto- ıale according to Franz, eventually drawing them up by a suture to the bladder ɔf the urethra laterally. This operation must precede of course a considerable ilization of the bladder from its surrounding scars. In case of the urethra ıg completely, one could perhaps by means of two parallel incisions at the rior vaginal wall, which is generally still in good condition, form an artificial ıra, joining the medial borders of the incision, leaving a corresponding large ɜrior surface for fixing a catheter which must be introduced. One would have ut then the extremities of the levator round this artificial urethra and at a ıd or third operation, the preventive sectio alta counting as the first operation, he lifted up posterior end of this channel in the bladder, before and after ing. We never made this operation in vivo, only twice in mortua and it seems promising.

The levator ani had been already used before by Bentley-Squier(50) and in the time by Keyes(51) in the man, at an incontinence-operation Keyse sutured the levators at the fore part of the bulbo cavernosus. Brjosowsky(52) had a fine ess in operating on a man with incontinence by the method of the levator ;ic. We still want to mention the older case of Sellheim, who used among other cles also the levator and formed—from a H-shaped section (just as in son Taits operation of the rectum) taking also the m. perineus profundus and ɹrficialis—a new urethra and this with full success. Roeder(53)(*a*) and

(*a*) *See* also Sturmdorf, A.(54).

(27) Hartmann .. .. .. Rétrécissements du rectum. Hotel Dieu, Paris, *Journ. des Practiciens*, 38, No. 34, p. 551.

(28) Buie Louis .. .. Benign strictures of the rectum, *Journ. Amer. Med. Assoc.* Vol. 81, No. 16.

(29) Sutejew .. .. .. Zur Klinik u. Pathogense der elephantiastischen Vorgänge im rectum, *Moskovskij. Medicinskij. Zurnal. Jahr.* V. No. 12, pp. 36 - 42.

(30) Bensaude (1926) .. .. Rectoscopie—Sigmoidoscopie, Masson and Co.

(31) Gougerot, H. (1925) .. .. Tuberculoses et nocardoses élephantiasiques ulcéreuses et fistuleuses recto-ano-périneo-genitales. *Presse Med. Jg.* 33. No. 67, pp. 1121—1126.

(32) Garsaux (1877) .. .. Th. Paris.

(33) Poelchen (1892) .. .. Virchow Archiv. CXXVII.

(34) Reichle-Tietze (1927) .. Handbuch der chirurgie von Kirchner-Nordmann.

(35) Tissau (1927) .. .. Traité de Symptomatologie Topograph. Chirurgicale, Paris, p. 453.

(36) Delbet et Mouchet (1893) .. *Arch. Gen. de Med.*

(37) Gosselin (1857) .. .. Recherches sur les rétrécissements syph. du rectum, *Arch. Gen. de Med.*

(38) Matthes .. .. .. Differential diagnose der inneren Krankheiten.

(39) Cornil and Ranvier (1912) .. Manuel de Histologie, Illustration of a histological section.

(40) Rotter .. .. .. Handbuch der praktischen Chirurgie, Chirurgie des Bauches.

(41) Drueck, C (1925) .. .. Syphilis of the anus and rectum, *Med. Journ. and Record*, Vol. 121, No. 4, p. 197 and No. 5.

(42) Citron .. .. .. Klinische Bakteriologie und Protozoologie Stein, Geschlechtskrankheiten, Lehmann.

(43) Kyrle (1926) .. .. Histobiologie der Hautkrankheiten, Springer.

(44) Pattiradjawane (1925) .. Zeldzame localisaties van het ulcus tropicum overgedruckt uit het, *Geneeskundig Tydschrift voor Nederlandsch-Indie*. Afl. 5 Deel 65.

(45) Kayser (1911) .. .. Voordrachten over tropische huidziekten, blz. 173-174.

(46) Eastman (1927) .. .. *Surgery*, Vol. 2, July, p. 145.

(47) Franz, R. (1919) .. .. *Wr. Klin. Woch. Jahrgang*, 32, No. 7.
Idem (1925) .. .. *Ibid*, No. 22.

(48) Kalischer, O. (1900) .. .. Berlin.

(49) Zangemeister, W. .. .. *Zeitschrift fur Gyn. Urologie*, 1, Heft 2.

(50) Bentley-Squier (1912) .. Post-operative urinary incontinence, *Med. Record*, *Ref. Zeitsch. f. Urol.* 1912, 6.

(51) Keyes, G. L. (1926) .. .. An operation for incontinence of urine following Perineal Prostacectomy, Surgery Gynec. S Obst. XIII, p. 423.

(52) Brjosowsky, A. G. .. .. *Arch. f. Chir.* Vol. 123, pp. 116—123.

(53) Roeder (1927) .. .. *Surgery*, July, Vol. XLV, p. 102.

(54) Sturmdorf, A. (1925) .. .. *Surgery*, II, p. 358.

(55) Watkins (1925) .. .. Utilization of thorough dissection of the anterior vaginal wall for closure, *Surgery*, I, p. 275.

EXPLANATION OF PLATE XLIV.

Fig. 1 *Half-schematic picture of the stationary illness The bulging of t* anterior vaginal wall is drawn down with tongues.

Fig. 2 Physiognomy of the vulva altered chronic elephantiastically, a pro is to be seen passing the slit under the undermined and loosened labiu minus.

Fig 3. Physiognomy of rectum in a later state of the illness. There is a strictu of the rectum, 3 cm above the anus The anterior vaginal wall drawn up

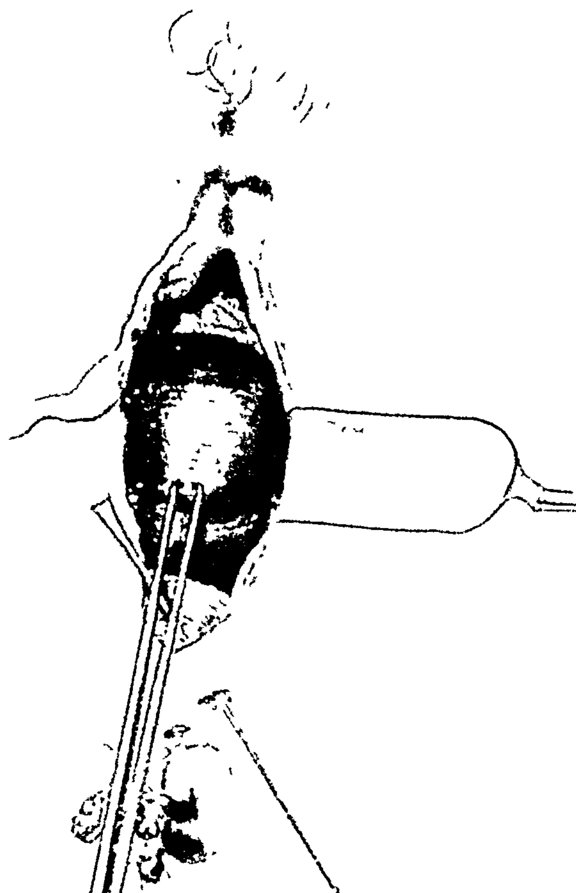


Fig. 1.

The objects and aims of all these organizations are practically the same, i.e., the improvement of the mental health of the community by a close and critical study of social habits with a view to eradicating factors which lead to mental ill-health. In other words, the concern of mental hygiene may be said to be the promotion and preservation of right and efficient living. Finally, mental hygiene must include the care of the handicapped in order that the environment may be as positively favourable as possible. Although, it must be admitted, many of these latter considerations belong to the domain of psychiatry, mental hygiene cannot ignore them.

With this outline of the scope and aim of mental hygiene in general, I will now pass to the particular aspect of mental hygiene which I have chosen as the subject for my address, namely, the mental hygiene of Europeans in the tropics.

There may be some present who consider that tropical conditions have no special bearing on the mental health of Europeans, hence there can be no necessity for making any such distinction. I am quite willing to admit the majority of books on tropical medicine and hygiene contain hardly any mention of the tropical psychopathology of Europeans. For example, the classical work of Manson makes no mention of nervous diseases among Europeans. On the other hand, there are two books by German writers which do contain references, albeit very short ones, to mental disorders among European residents in tropical countries.

In the 'Handbuch der Tropenkranheiten,' edited by Dr. Carl Mense, Van Brero, a Dutch neurologist, discusses what he regards as a specific form of irritability among Europeans resident in the tropics, under the name of 'Tropenkoller.' Van Brero admits that 'Tropenkoller' is rare among Europeans who live under agreeable conditions but common among those who live lonely lives deprived of the usual amenities of civilization. He considers the climate to be a contributory factor and when to it are added loneliness and discomfort, a neurosis develops which leads to excesses in Baccho et Venere with their inevitable consequences of mental degeneration. At the same time, he maintains that to degenerate in this way, even under the worst conditions, connotes in the individual concerned the existence from the beginning of more than the average allowance of 'la bete humane'; for, as he says, 'Coelum non mutat animum qui trans mare currunt.' Van Brero concludes his short but interesting review of this important phenomenon by reminding his readers that in our present state of ignorance of tropical psychopathology, we must suspend judgment as to the causation of these particular psychic disorders. Besides this so-called 'Tropenkoller,' Van Brero describes a type of neurotic disorder to which he gives the name of 'Neurasthenia.' He maintains that in this condition a high blood pressure is an invariable feature. In addition to a high blood pressure, the condition is associated with an auto-intoxication due to constipation. Van Brero does not attach all the blame for this disorder to the climate but thinks that alcoholism, arthritis and 'over-work,' mental as well as physical, are factors

MENTAL HYGIENE AND PSYCHIATRY.

MENTAL HYGIENE OF EUROPEANS IN THE TROPICS.

BY

LIEUT COL OWEN BERKELEY HILL, M A, M D, I M S

THURSDAY, DEC 8TH, 10 A M TO 1 P M

ALTHOUGH tropical hygiene is now a well developed branch of general hygiene, its scope has until quite lately failed to recognize the mental aspect of the problems of human well being in tropical countries That this should be so is hardly a matter for surprise because the very concept of 'mental hygiene' is of quite recent origin Therefore, before taking up the question of a special mental branch of tropical hygiene, I think it will be as well for me to outline as briefly as possible, what is, to the best of my knowledge, the existing conception of mental hygiene in general Although the term 'mental hygiene' appears occasionally in literature between the forties and the late eighties of the last century it does not figure in Tuke's Dictionary of Psychological Medicine (1892) nor in Baldwin's Dictionary of Philosophy and Psychology (1901—05) In 1907, Mr Clifford W Beers the author of that remarkable book, 'A Mind that Found Itself' adopted the term 'mental hygiene' as a 'watch word' in America of a projected agency for reform and education in the field of nervous and mental diseases Since that date the term 'mental hygiene' has been acquiring a wider and a wider vogue A rapidly growing literature has sprung up, to which many sciences have contributed, especially psychiatry, psychopathology and psychology One result of this movement initiated by Mr Beers was to make the people of the United States of America the first to recognize the importance of the conception of mental hygiene, so that in 1916 there came into being a National Committee for Mental Hygiene In 1917 this Committee started a quarterly journal, entitled 'Mental Hygiene' in which the Committee published articles and reports of investigations carried out on the lines which were laid down by the Committee at its constitution In 1920 France followed the example of America and founded 'La Ligue d'Hygiene Mentale' under the patronage of the Minister of Health In 1923 England followed suit and started a National Council for Mental Hygiene under the presidency of Sir Courtland Thomson In Germany organizations of a similar description came into existence during the war

anything could show more clearly than do these replies to the enquiry of the Bishop of Singapore, how almost hopelessly ignorant we are about a state of affairs which no one can deny is of some considerable importance.

That the laity has long recognized the fact that Europeans are more liable to some form of mental disorder in the tropics than in temperate climates, is shown by the existence of such terms as 'Punjab head,' 'West Coast head,' 'Soudanite,' 'Colonite' and 'Tropenkoller.' Further, that this 'upset of mental balance' is not a product of the times in which we live, is shown in the correspondence of Sir Arthur Wellesley (afterwards the famous Duke of Wellington), to his brother, Lord Mornington, in which the former deplores the frightful irritability of many of his British officers in the Army in India. Novels, books of travel, and so forth, dealing with life in the tropics, abound in references to mental disorder among Europeans. Kipling's 'A Disturber of the Traffic,' Conrad's 'An Outpost of Progress,' and Seton Merriman's 'With Edged Tools.' all contain intensely vivid descriptions of such disorders. In a remarkable book on Africa, entitled, 'The Golden Stool,' the author, Mr. Edwin W. Smith, describes what he terms the 'Irritability of Africa,' 'which makes honourable European gentlemen commit crimes of which they blush to think in after days...........the enervating climate, the madness caused by fever germs rioting in the blood, the loneliness which dooms a man to live for long months without seeing a companion of his own colour, the continual down-drag of a barbarous environment, the sense of being of a superior race, the possession of power over weaker peoples; these go far to explain, if they do not excuse, the loathsome deeds done under the tropical sun........pages of this book could easily be filled with descriptions of acts that would make the reader's blood curdle with horror and boil with indignation.'

We may turn now to Col. Acton's lecture on neurasthenia in the tropics. Among the numerous symptoms which in Col. Acton's opinion make up the clinical picture of this form of neurasthenia, irritability is not included. On the contrary, Col. Acton considers that the chief characteristic of tropical neurasthenia is depression with a tendency to hypochondria or morbid anxiety. In discussing the ætiology of the condition, Col. Acton classifies the causes as exciting and predisposing. Among the former, Col. Acton places toxæmia as pre-eminent, while he holds the predisposing causes to be climate, anæmia, bad food, and excessive exercise.

Now I think it is very likely that it will occur to those of my audience who are neurologists that if we disentangle this mass of symptomatology, we shall find that Europeans living in the tropics are prone to a neurotic syndrome, the central symptom of which is a state of hyperexcitation manifested in a general irritability or a condition of morbid anxiety. Although hyperexcitation may appear as a symptom of any form of psycho-neurosis or psychosis, none show it so consistently nor so strongly as that neurosis to which Freud has applied the name anxiety-neurosis (Angstneurose). Hecker was the first to describe this

in its causation He considers very hard mental work to be perhaps the commonest cause of 'tropical' neurasthenia, especially among those who will not realize that the capacity for mental strain is lowered by long residence in hot countries Van Brero makes special mention of insomnia among Europeans in the tropics particularly at the change of the seasons and he ascribes to want of sleep a considerable share in the production of neurotic disorders Scheube in his 'Krankeiten der Warmen Lander' believes that long residence in a tropical climate produces sleeplessness and nervous irritability' and the latter when coupled with chronic malaria ends in neurasthenia Scheube considers that mental disorder is more common among Europeans in the tropics than in their own countries He holds strongly to the view that no one of a 'neurotic' stock should embark upon a career involving prolonged residence in the tropics Like Van Brero Scheube cites Tropenkoller' as one of the prominent psychic disorders of Europeans in hot countries and he directs attention to Mense's opinion that this morbid emotional state is a remarkable compound of hate and affection, a point of view which coincides with the Freudian conception of the ambivalence of these emotions Mense goes so far as to hold that a considerable percentage of Europeans who elect to dwell in the tropics are by nature 'eccentric' and it is owing to the existence of an inherent abnormality of temperament that they came to leave their own homes! Although this view may not make a strong appeal to many people, especially the English my own experience has led me to believe that there is a good deal of truth in it

The only other references of importance which I have been able to discover are a copious correspondence in the *British Medical Journal* of last year and the publication in the *Indian Medical Gazette* of this year of a lecture delivered by Lieut Col H W Acton, I M S before the *Asiatic Society* on 'Neurasthenia in the Tropics

The correspondence in the *British Medical Journal* arose out of a letter written to that journal by the Bishop of Singapore, entitled, 'Mental Irritability and Break down in the Tropics' The Bishop of Singapore gives as his reason for addressing the *British Medical Journal* a desire to know What is the cause of the upset of mental balance which is so common in the tropics?' This upset ranges from excessive irritability or loss of judgment to lunacy or suicide Indeed, had the Bishop of Singapore added 'murder' to his list of things to which this 'mental upset' may give rise, no one could have gainsaid him To this enquiry the *British Medical Journal* published eight replies mostly from medical men Now, while all the writers admit the truth of th Bishop of Singapore's contention that 'upset of mental balance' is comm amongst Europeans in the tropics no two of them appear agreed as to the c or causes of it Among the array of causes cited by these doctors, are alti moisture strong sun light, eye defects, worry, hyperaemia of the brain wind barometric pressure, electrical content of the atmosphere, food constipation, native servants, masturbation and smoking. I think th

refer, is a species of anxiety-neurosis. The validity of this supposition is strengthened as soon as we come to study the ætiology of the anxiety-neurosis. From the investigations of Freud and others, the prime ætiological factor in the anxiety-neurosis, at any rate in men, is voluntary abstinence from sexual intercourse. Privation of this kind causes an accumulation of somatic excitation which then tends to get dissipated along paths through which it can find its discharge more easily than along the path to the mind. Libido will therefore subside and the excitation will express itself subconsciously as anxiety. In respect to women the principal cause of anxiety-neurosis is 'coitus reservatus' but, of course, voluntary or enforced abstinence will have the same effect on women as on men. In addition to these ætiological factors. i.e., voluntary abstinence and coitus reservatus, anxiety is likely to appear in those who suddenly renounce masturbation after having practised it for a long period. Anxiety-neurosis may also follow serious illness, over-work, exhaustive sick-nursing, etc., because by deflection of interest the mind cannot any longer master the sexual excitation of the body, a task which is continually incumbent upon it.

Now I maintain that the conditions under which Europeans generally, though by no means always, live in tropical countries, are such as to promote development of an anxiety-neurosis, especially in men.

First, sexual abstinence is frequently, for many Englishmen in the tropics, an inevitable part of their lives, even when they are married. The seasonal exodus of European women to the hills, or to Europe, involves constant changes in their sexual lives and in that of their husbands. To both, but more especially to the men left to toil in the heat of the plains, or of the large cities, the deprivation of the means of gratifying the sexual impulse, cannot fail to produce some effects, direct or indirect. To the direct effects I have alluded already. From among the indirect effects, I propose to select only one, because it is not only the most important but by far the most common. I refer to alcoholism. By 'alcoholism' I do not mean the immoderate consumption of wines and spirits, although this may sometimes supervene, but the resort to drinking as a means of escape from the psychic tension set up by the anxiety state. Most of us know, for it is a demonstrable phenomenon, that alcohol promotes the regression of the sexual libido to a more primitive level by paralysing the inhibitory forces which ordinarily hold in check any tendency to regression. In this instance, the regression is from the heterosexual to the homosexual level. One has only to sit in the bar of any club in the tropics to be a witness to this phenomenon. It is only necessary to watch the behaviour of the majority of the men there and to listen to their conversation, to be able to recognize unmistakable signs of the regression of libido. Still worse, of course, is the condition of the European doomed to live alone in some out-of-the-way place. Here, the absence of another of his own race and class may quickly bring about a loss of self-respect, so that any degree of alcoholism up to dipsomania, may develop. Now, because alcoholism lowers the forces of inhibition in one direction, i.e., the sexual, it does

condition, but it was Freud who recognized the unitary nature of the syndrome and its nosological independence According to Freud, the clinical picture of anxiety neurosis comprises the following symptoms

1 General irritability Although this is a common symptom and as such belongs to many nervous conditions, it is invariable in anxiety neurosis One form of expression of this form of irritability is an over sensitiveness to noise and auditory hyperæsthesia is a frequent cause of insomnia, more than one form of which belongs to the anxiety neurosis

In the medical evidence which I have cited there is a general consensus of opinion that 'irritability' and 'insomnia' are prominent symptoms of mental disorder among European residents in the tropics The same applies of auditory hyperæsthesia Any resident in the tropics knows that whenever he is a 'little run down,' how the chattering of native servants or a dog barking or a tom tom beating can give rise to exquisite suffering

2 Anxious expectation Under this heading we may class a particular form of anxious expectation which is very commonly observable among Europeans of both sexes in tropical countries I refer to anxiety about one's own health This 'hypochondria,' to use an old term, is generally manifested in relation to sunstroke, glare, and bowel complaints Besides hypochondria, another form of anxiety appears in pangs of conscience, over scrupulousness and pedantry In my experience this type of anxiety is not uncommon among Government officials, especially Europeans of the Indian Civil Service, with whom it may sometimes amount to a veritable 'folie de doute'

3 Awakening in fright As undue sensitiveness to noise may cause insomnia, so this condition of anxious expectation may evoke 'pavor nocturnus' As anxious expectation is the nuclear symptom of this condition, we may perhaps say that there is here a quantum of anxiety in a free floating condition which is ever ready to attach itself to any suitable ideational content

4 Brooding This form of mental occupation is an expression of the anxiety state and appears fairly consistently in the syndrome It arises from the individual's effort to disprove that he is ill, as his hypochondrical phobia maintains

5 Disturbances of the alimentary canal In the anxiety state the digestive processes are not the only ones subjective to disturbances, but they are perhaps the most characteristic Sensations of nausea and biliousness are not at all rare and probably a good deal of what is usually termed 'liverishness' is neurotic rather than hepatic in origin The symptoms of ravenous hunger can by itself, or in combination with others, constitute a rudimentary anxiety attack In other cases, there may be a tendency to diarrhœa which may give rise to the queerest diagnostic mistakes

From the above sketch of the principal manifestations of the anxiety neurosis, I think that there is some justification for the assumption that the mental disorder of Europeans in the tropics, to which the writers I have quoted

the important issue of statistics regarding the mental health of Europeans in the tropics. To the best of my knowledge none exist. For example, the influence of temperature, humidity, clothing, diet, work—physical and mental—exposure to the sun, isolation and many other factors, on the mental well-being of Europeans in tropical countries, remain an unexplored field. Even in respect to temperature—perhaps the most formidable of all the conditions with which Europeans in the tropics have to contend—very little is known. In his interesting study on the character of races, Huntington states that for all European people the most favourable conditions of climate are essentially the same, namely, a temperature which on the average for day and night does not rise above 70°F. in summer, or fall below 40°F. in winter. Extremes may of course be greater. Physical health and activity are at their highest when the outdoor temperature for day and night averages about 64°F. While mental activity seems to be greatest at a lower temperature, possibly as low as 40°F. among people who heat their houses. A fairly high degree of humidity appears also to be favourable at moderately low temperatures, but not at high temperatures. Variability and storminess seem also to be important. While all races have not yet been investigated in this respect, many facts suggest that for practically the whole human race a temperature that averages betwéen 60°F. and 70°F. is better than one which averages about 70°F. It is therefore evident that Europeans in tropical countries, except those who live at high altitudes, exist under a perpetual disability. This being so, it is evident that the climate of all tropical countries must play an important but hitherto unassigned rôle, in the mental well-being of European residents. So far, however, the climatic as well as the other factors which I have enumerated, have never been subjected to a proper study. The people of Europe, who possess colonies in the tropics, have up to the present time been content to ignore the whole problem, although quite recently there are indications that the French are becoming alive to the importance of studying mental disorders peculiar to, or met with, in tropical countries. In this connection, everyone who is interested in this subject will deplore the untimely death of Médecin Inspecteur General Gouzien who was the first to make any definite move in this direction. In India, the birth-place of so many and so valuable contributions to tropical medicine and hygiene, the condition of affairs as regards the mental aspect of medicine is nothing less than deplorable. In the civil employment of the Government of India there are at present only four Europeans and two Indians who have had any special training in psychopathology. In the great cities of Calcutta, Bombay and Karachi, there is no European or Indian neurologist or psychiatrist with European qualifications. In the numerous schools and colleges throughout India there is no provision for adequate instruction in nervous and mental diseases. However, at the instigation of the Surgeon-General to the Government of Madras, the officials of this province are just now considering a programme involving fundamental reforms in the teaching of mental pathology and hygiene which will include a reorganization of its mental

not exclude other directions also Indeed, alcohol reduces the strength of the inhibitory forces in every direction so that at least one other consequence is a loss of control over the emotions Hence it is hardly a matter for surprise that we meet occasionally in the tropics Europeans who either suffer from violent outbursts of anger or from a brooding melancholy Of course, the quantity and quality of the reaction will vary with the temperament and cultural attributes of the individual concerned The brooding tendency is frequently characterized in its early stages by an over scrupulosity in respect to work This type of reaction is moreover favoured by the fact that the anxiety or the neurosis is often accompanied by an abatement of sexual desire which in its extreme form, may lead to the development of psychic impotency and culminate in suicide We must now consider the second important cause of anxiety states namely, coitus interruptus This practice is quite lamentably common among Europeans living in tropical countries The bad effects of it are more often met with in women than in men, but neither sex is exempt The effects of prolonged practice of coitus interruptus are many and varied—sleeplessness and general irritability with hyperæsthesia to auditory sensations are perhaps the commonest Other chronic symptoms are giddiness, paraæsthesia- simulating rheumatic pains- vasomotor congestions and gastro intestinal disturbances especially nausea and diarrhœa When one group of symptoms is specially prominent, particularly the cardiac, respiratory and gastro intestinal, the condition is very apt to be mistaken for organic disease

I will now consider shortly the prevention and treatment of the anxiety neurosis The conclusions we have reached may be summarized as follows *The essential cause of all kinds of anxiety states consists in a lack of* psychical gratification of the sexual hunger, the anxiety arises in the inborn fear instinct, and the exaggeration of its manifestations represents a defensive response to repressed sexual impulses In all cases the psychical factors play an important part in many, even the sole one The physical factors are often contributory but they alone are perhaps never sufficient to evoke an anxiety state, in addition these factors always have an important psychical side The treatment then should consist first in the removal of the physical factors, e g coitus interruptus etc Sometimes it is not very easy to remove these factors when, for instance, we have to deal with sexual abstinence in widows over a certain age, in young girls, etc To benefit patients who belong to these categories, probably psycho analytic treatment is the only treatment which is likely to produce lasting benefit For the prevention of the anxiety states, what is most needed is education of the public, and, indeed, of the medical profession too, into the ætiology of the disease How far it is desirable to advocate concubinage as a measure of prevention among men, especially those situated in lonely places, is largely a matter for public opinion to decide As far as I am aware, no statistics are available as to the incidence of anxiety states among men who maintain a strict celibacy as opposed to those who do not This point raises

one of their members to write a pamphlet for the instruction of Indian Christians on birth-control. In this case there is a definite need of help for the wisdom of such an action may well be questioned from a mental hygiene point of view. What is the attitude of those capable of speaking concerning the mental hygiene aspects of such a matter ?

There are many other questions concerning both Indian and European mental health which need investigation and there is much need of popular instruction.

A committee of mental hygiene for India patterned after the English, continental and American committees would be able to meet such a need. If the leaders of this work in India would bind themselves together into such a committee, it would give greater impetus to the spread of the knowledge of mental hygiene.

Dr. K. B. Lele (Bombay) : Maintained that, as Indians apparently suffered less from neurosis than Europeans in the tropics, they should therefore be more fit for work under such conditions.

Captain J. E. Dhunjibhoy, I.M.S. (Bihar and Orissa) : I am in charge of the largest mental hospital in India and am carrying on practice amongst Indians. I am thus qualified to speak on the remark made by Dr. Lele in his discussion on Col. Berkeley Hill's paper that the Europeans are more affected in the tropics than Indians. I am of opinion that Indians are more liable to anxiety-neurosis and neurasthenia than Europeans in the tropics and I have seen in my experience many Indians suffering from these complaints. Dr. Lele's contention, therefore, does not hold good.

Dr. M. N. Batchelor (Bengal) : Asked what could be done for these patients ?

Dr. H. Davies (United Provinces) : What effect does residence in a tropical country have on men and women who inherit a tendency to insanity ? Should such come to India ? If they have come, what special precautions should be taken in caring for such patients ? Does a European patient who has been infected with syphilis, develop general paralysis of the insane more readily in India (the tropics) than in a cold country ?

Prof. J. L. Rosedale (Straits Settlements) : I should like to ask Col. Berkeley Hill whether he has any information concerning food factors. The European in the tropics usually avoids fresh green foods, frequently finds a supply of good milk difficult to obtain and partakes of what is left of an European diet : a white bread and meat diet. Experiments show that the fruits added to this do not altogether satisfy the balance usually lost by such a diet.

Dr. H. C. Menkel (Punjab) : My observation of the nervous and mental problems among Europeans incline me to believe that these are perhaps due more to endocrine disturbances than to a primarily sexual cause. The cause of the endocrine disturbance may be found in frequent infections and the strong acid tendency of the average European diet.

Rai Bahadur Dr. Chuni Lal Bose (Bengal) : Col. Berkeley Hill has dealt with an interesting point in his learned and interesting paper, viz., the relation between sexua gratification and neurosis. So far as my experience of Indian life is concerned, we find that abstinence, *even total abstinence*, has very little to do with the causation of insanity. A very large number of Hindu widows of the respectable class live a pure widowed life from the day of their marriage to death (in spite of what Miss Mayo has said in her

hospitals This programme includes outdoor clinics, the institution of a ward in the General Hospital for early cases of mental disorder and the construction of a home for mentally deficient children These measures must bring about, in Madras at any rate, a considerable improvement in the attitude of the public towards mental disorders and their prophylaxis and treatment They will also in time provide a cadre of properly trained specialists to promote the study of *the mental health of the community* Lastly, *we may hope to see the other* provinces of India follow the example of Madras It was only four years ago that the General Medical Council of Great Britain refused to recognize any longer the M B degree of the University of Calcutta on account of the inadequate training the University afforded its students in gynæcology and obstetrics It is not unlikely that before very long the value of the medical training of the Calcutta University will undergo a further depreciation on the score of the insufficient facilities it provides for the study of mental pathology 'Of all the ways of Providence,' said Voltaire 'nothing is so inscrutable as the littleness of the minds that control the destinies of great nations' Are we to suppose that the minds of those who control the destiny of this vast country are so little that they are incapable of learning the lesson mental hygiene has to teach ?

The aim of man for the last ten thousand years has been the mastery of things. For the future his aim must be the mastery of himself The vast material revolution of the last hundred years has so multiplied the uses of our lives as to leave the civilized races of the world dazed and perplexed In an epoch of stress, and of much change and readjustment in the social surroundings and relations of individuals the ill balanced natures become more frequent and the anti social and unlawful instincts are more often called out than in a stagnant society Like criminality, insanity flourishes among migrants and our civilization is bringing us more or less into the position of migrants Whether we will or no, it seems probable that the white races will before long attempt to control their own physical and mental evolution The rest of the world will have to follow suit or perish This attempt is sure to create terrific rivalries, dissensions, revolutions, and even wars , no man can foresee what will happen To timid souls the prospect is appalling To the true pioneer and still more to the seeker for truth, it is the cry of battle to the warrior Behold what natural selection seems to have done in the past in Greece ! Dare we attempt to do the same once more in a grander, better way ? And can we succeed ? These are the questions which centuries of struggle will answer during the biological revolution whose dawn, even now, reddens the eastern sky

DISCUSSION

Dr Victor C Rambo (Central Provinces) I am sure that we are all very interested in such a timely and interesting paper as Col Berkeley Hill has given us Recently one need for expert guidance in mental hygiene has come to the speaker's notice A committee in charge of education of a small group in the Central Provinces asked

THE ROLE OF 'INDIAN HEMP' IN CAUSATION OF INSANITY IN INDIA.

BY

CAPT. J. E. DHUNJIBHOY, I.M.S.,
Superintendent, Indian Mental Hospital, Ranchi.

THERE is a special form of mental disease commonly met with in India which is usually produced by excessive or even prolonged moderate use of hemp drugs in any form. This form of insanity is particularly prevalent in the Provinces of Bengal and Bihar & Orissa, as Ganja is largely cultivated in Bengal and naturally the use of this drug is very common. This form of insanity is characterized by symptoms which are of a fairly uniform character, and in a large majority of those afflicted no psychopathic or neuropathic history can be elicited.

Sex.—It is generally confined to male sex as a large number of addicts to these drugs are males, but I have also observed two female patients suffering from hemp insanity and similar cases have been reported by other medical officers in charge of different mental hospitals in India.

Age.—Generally between the ages of 20 to 40, but I have also treated a boy of 15 and an old man of 65.

HISTORICAL.

The hemp plant is not indigenous to India. It was originally brought to India from Central Asia where the plant was indigenous. The earliest notice of the hemp plant in India is mentioned in the Atharva Veda, the reading of which shows that the narcotic property of the plant was also known. The plant reached India as a fibre-yielding species and developed the narcotic property for which it is now chiefly celebrated in India. The sudden development of the narcotic property of the plant in India is the result of response to the conditions of its environment. Having thus developed the narcotic property in India, the plant and its new use spread northwards into the Himalayan valleys, into Tibet and into China where its original use was, as in Europe, as a fibre plant. It then proceeded westward, as a narcotic, into Persia, Syria, Arabia, Egypt and Malay. This history, therefore, proves that though the hemp plant passed as a fibre plant from Central Asia to India, it passed back again as a narcotic-yielding plant from India to Central Asia.

book), and very few of them are known to suffer from derangement of mind, they generally live to a long age in a healthy condition both of body and mind In ancient India, the boys used to receive their education in their preceptor's house and they used to observe *Brahmacharyya* (self control), particularly in matters connected with sex Such abstinence from sexual enjoyments was not known to produce insanity among the students and people of ancient India In my opinion such abstinence used to give them a stronger and healthier body and mind than that which it is our good fortune to possess nowadays I believe Sir Isaac Newton, the father of modern physical science, was a life long bachelor and was innocent of all matters connected with sex To my mind, it is the inordinate brooding over sexual matters without adequate opportunity for gratification that may produce derangement of mind and not abstinence in the proper sense of the term, from sexual thoughts and gratification

Lieut Col O Berkeley Hill, I M S (Bihar and Orissa)

In reply to Dr Rambo The Indian Psychological Association, although a very young and small society is *anxious and willing to participate in work of this description* and has already begun to try to tackle the question of mentally defective children

In reply to Dr Batchelor The sexual irregularities must be stopped and as far as circumstances permit a healthy sexual life instituted This was not always easy failing this he believed nothing was of any permanent value but psycho analysis

In reply to Dr H Davies He agreed with Dr Van Brero that no person from a neurotic stock should work in the tropics, but at the same time the subject was yet another of the many which called for intensive investigation He was collecting data to help on this point In regard to the special precautions that one should prescribe for such persons, he could only advocate general adherence to the laws of health as we knew and understood them at present and the avoidance of every form of excess The incidence of G P I in India was so small that no data existed in respect to this subject

In reply to Professor J L Rosedale He had called attention in his paper to the urgent need for more work on this topic

In reply to Dr H C Menkel There was no more particular evidence in support of the view expressed by Dr Menkel than there was in support of the converse, i e, that the mental disfunction precedes and produces the endocrinological disorder In view of the extraordinary things people, the world over eat and drink and remain apparently safe, the diet factor could hardly play such an important part

In reply to Dr Chuni Lal Bose He could not venture to reply to the first part of the point raised by Rai Bahadur Chuni Lal Bose, but he thought that the Rai Bahadur could hardly have chosen a more unfortunate example than Sir Isaac Newton who became quite insane at the age of 35 and remained so for the rest of his life

(2) *Bhang* is, as a rule, taken as a decoction. It is the cheapest and the weakest form of the hemp drug. The word 'Bhang' is applied both to the dry drug and to the drink made from it in the same way as the word 'Tea' is used. Every Bhang drinker who can afford it adds some or the other of the following spices in the preparation of the decoction: Anise, fennel, coriander, dill, almonds, rose-water, cloves, saffron, or cardamom. Here, again, as in the case of Ganja, the seeds of Dhatura, opium, arsenic, etc., are mixed to produce the desired effect of profound intoxication. Bhang is also eaten in pan or with molasses. A Bhang drinker will eat Bhang when he has difficulty in preparing the decoction, especially when travelling in the train. There is, also, a considerable consumption of sweetmeats made with Bhang. The sweetmeat is known by the name of Majum from one end of India to the other. Majum is made of sugar, milk and an essence of Bhang, but occasionally Ganja and Charas are added. Bhang is sold in the bazar at 4 annas per tola. A habitual drinker takes half to two tolas per day.

(3) *Charas* is smoked in a similar way to Ganja, but it is sometimes eaten in form of pills. It corresponds almost exactly to the preparation known as Haschisch in Arabia. Charas, being the pure form of the drug, is very expensive, hence is used by the well-to-do only. The cost of Charas is Rs. 5 per tola and the average daily ration of a habitual smoker is quarter to half a tola.

Social and Religous Use of Hemp Plant.—It is almost an universal social custom in Bengal and Bihar and Orissa and other Provinces in India with the Hindus to offer Bhang to guests and members of the family on festive occasions. The hemp plant is popularly believed to have been a great favourite of the great God Shiva of the Hindu Trinity, and the drug, more specially Ganja, is largely used in religious practices connected with the worship of the God. Religious ascetics, who are regarded with great veneration by the people, believe that the hemp plant is a special attribute of the God Shiva and this belief is largely shared by the people. Among the Sikhs of the Punjab, the use of Bhang is common and is consumed as an essential part of their religious rites having the authority of the Granth (their religious scriptures). Charas does not seem to be in any way connected with religious observance. The use of hemp drugs is, as a rule, in no way connected with the social or religious customs of Mohammedans as the Mohammedan religion condemns such practices.

Revenue from Hemp Drugs.—The excise report of the Bengal Presidency for 1925-26 shows the total revenue for the year from hemp drugs to be as follows:—

Ganja .. Rs. 43½ lakhs or Rs. 4·35 millions.
Bhang .. ,, 2½ lakhs.
Charas .. ,, 2½ lakhs.
Total Rs. 48½ lakhs or Rs. 4·825 millions.

It will be seen from this that Ganja is the most important of the three hemp drugs used in the Bengal Presidency and it contributes nearly the whole of the hemp drug revenue.

Indian Hemp (Cannabis sativa) -- The Indian hemp plant grows wild in all the provinces in India It is prevalent throughout the Himalayas from Kashmere to the extreme east of Assam The plant appears to propagate itself For excise purposes the plant is specially cultivated in some provinces in India, for example Ganja in Bengal and Charas in Yarkand The wild plants also yield narcotics The Indian hemp plant is a tall, erect herb growing from 3 to 8 feet high when wild When cultivated, it is from 4 to 5 feet high There are two distinct sexes of the Indian hemp plant, male and female

THE PRESENT USE OF THE HEMP DRUG IN INDIA

The hemp plant is used in the following three chief forms in India —

(1) *Ganja* which is the Indian name applied to a mixture of stems leaves and flowering tops of the cultivated female hemp plant which have become coated with resin in consequence of having been unable to set seeds freely In Bengal Ganja is grown in a compact tract of country about 69 square miles in area at Nowgaon in the district of Rajshahi This area supplies not only the local requirements of the Presidency but also those of Assam Bihar and Orissa and the United Provinces and certain Indian States and foreign territories

(2) *Bhang* Siddhi Subji or Putti are different Indian names applied to a mixture of the dry leaves and capsules without stems whether male or female, cultivated or wild Wild Bhang grows all over the Bengal Presidency but the cultivated Bhang required for the Presidency is obtained from Bihar and Orissa where it is specially cultivated for excise purposes

(3) *Charas* —Charas is the name applied to the resinous matter which exudes from the flowering heads of the female plant when collected separately

The hemp drugs are consumed in India as follows —

(1) *Ganja* is used chiefly for smoking It is smoked in the chilum hooka, tobacco pipe or cigarette It is generally smoked with tobacco in the proportion of three to one Ganja has an offensive smell To avoid it, well to do people flavour their pipes with spices so as to give a fragrant flavour to the pipe The spices commonly used for this purpose are musk, saffron, cloves, cardamom, rose leaves and nutmeg Powerful and noxious drugs are generally introduced in the pipes by those on whom the simple form of Ganja has ceased to produce the desired effect of exhilaration and stupefaction The seeds of Dhatura (*Stramonium*), opium cocaine, nux vomica and aconite are the commonest ingredients of this class Ganja is also eaten in pan and I have seen some patients eating it raw It is consumed in all parts of the Presidency, and Bihar and Orissa The habitual consumer daily indulges in this drug from 2 annas to 8 annas worth according to his income It is stated by consumers that 2 annas worth of Ganja can produce the desired intoxication, but that they get used to it gradually and the amount has to be slowly increased The cost of Ganja is Re 1 4 per tola and the average habitual consumer requires about half to one tola per day It is stated that approximately one sixteenth of a tola fills a chilum or pipe

refer as a rule to beautiful women who are supposed to talk and copulate with the patients. (*b*) The duration of the attack is shorter and relapses are not so frequent if the drug is stopped at once. (*c*) Recovery is the rule in such cases. (*d*) Complete amnesia of all events is found on recovery. (*e*) A peculiar eye condition. (*f*) A characteristic dare-devil demeanour with an irresistible impulse to wilful damage. (*g*) There is a history of the drug habit and absence of a psychopathic or neuropathic heredity.

(2) *Chronic mania.*—The symptoms are more or less the same as those described in acute mania but less severe and the patients are generally cheerful and boastful with a sense of well-being. A very rare symptom, complete loss of speech, lasting for a prolonged period after recovery from the hemp drug intoxication, was first described by Dr. Chevers in his book on forensic medicine. I have so far observed complete loss of speech in one case of hemp insanity. The patient understood every word that was said to him and made vain attempts to speak. He suddenly spoke after a lapse of 8 years and told me that he understood every word that had been said to him and had made every effort to speak but found it impossible to do so. Recently a case of hemp insanity was admitted into the Ranchi Indian Mental Hospital in which the Police report states that the man lost the power of speech for nearly two years while at home. A very small number of chronic cases lapse gradually into secondary dementia.

Peculiar eye condition.—This eye condition is almost pathognomonic of hemp insanity whether the drug be a predisposing or exciting factor. In all such cases a marked conjunctival congestion is seen in the horizontal vessels of both eyes. Recent cases show acute congestion of these vessels, but in chronic cases the acute congestion is replaced by a well-marked line of blood pigments in the same situation. This was first pointed out by Major G. F. W. Ewens, I.M.S., in 1904. I have seen this peculiar eye condition in all cases of hemp insanity and also in cases where hemp was proved to be an exciting cause.

Diagnosis.—A patient admitted to an Indian mental hospital with intense excitement, exaltation of ideas, tendency to wilful violence and destruction, the peculiar eye condition described above, total amnesia of all events, with an attack of short duration followed by complete recovery with a history of the drug habit and without a psychopathic or neuropathic heredity is a typical case of 'hemp insanity.'

Prognosis.—The prognosis is certainly most hopeful. In acute cases nearly 90 per cent and in chronic cases nearly 40 per cent, recover.

Post-mortem.—I had the opportunity at Berhampore to perform a post-mortem on two cases of hemp insanity and macroscopically nothing abnormal was noted.

Treatment.—The drug must be stopped at once as its sudden stoppage produces no abstinence symptoms. The other treatment is symptomatic. A good nourishing diet, rest, exercise, regular bowels, etc., are very helpful. I have found hydrotherapy very useful in acute maniacal cases.

Toxic Effects of Hemp Drugs

In considering the effects of drinking Bhang, smoking Charas and Ganja, it must be remembered that the same active principle is present in all Hence the effect must depend upon the amount of the active principle present which is smallest in case of Bhang and largest in case of Charas, weight for weight Hitherto no active principle has been isolated from these drugs, hence it is difficult to compare accurately the physiological effects of the three drugs

Effect of a moderate dose — The intoxication varies from moderate to dead drunk Some become drowsy and semi comatose, rapidly passing into a dreamy state with a rapid flow of ideas often of a sexual nature and ending in a deep sleep Others go through a phase of psychomotor activities before passing into the dreamy state

Effect of large doses —These are followed by excitement, delusions hallucinations, rapid flow of ideas, a high state of ecstasy increased psychomotor activity with a tendency to wilful damage and violence These are followed by deep sleep and forgetfulness of all but the initial symptoms This property of the drug namely, temporary amnesia of all events, is highly important from the medico legal stand point It is very difficult to state the duration of the amnesia in both the simple intoxication and maniacal state With a view to judge this peculiar and important property I, in company with friends on two different occasions, drank a moderate dose of Bhang and smoked a pipe of Ganja On both occasions I remembered well the initial symptoms, but after that everything was a blank to me and the friends who did not partake of the drugs and enjoyed the fun at my cost gave a very amusing and instructive account of my actions under the influence of the drugs, which is omitted here for want of time and space The experiment taught me the amnesic property of the drugs and in future I shall not hesitate to believe any one who commits acts of violence under the influence of drugs and pleads complete amnesia of the crime on recovery

Hemp Drug Insanity

Iban Beitar was the first physician in the East to point out the mental derangement produced by the use of hemp Makrizi, a writer in Egypt in the fourteenth century, states that in 78 Hijra very severe ordinances were passed in Egypt against the use of hemp drugs and non compliers of these orders were subject to the extraction of their teeth, but in 799 Hijra the custom re established itself with more than the original vigour

The following three types of hemp insanity are commonly met with in mental hospitals of India (1) acute delirious mania, (2) chronic mania, and (3) dementia All these types are only a question of degree

(1) *Acute delirious mania* is the result of prolonged and excessive use of the drug in any form The symptoms resemble those of ordinary acute mania with the following differences (*a*) Hallucinations are visual and auditory and they

(2) In the case of psychopaths and neuropaths, hemp plays a secondary rôle.

(3) It is proved beyond doubt that the hemp drug is a direct cerebral poison. I put this drug above alcohol, opium and cocaine with regard to injurious tendencies in the causation of insanity in India.

(4) The experience stated herein is confined to the provinces of Bengal and Bihar & Orissa.

REFERENCES.

WADDELL .. .. .. 'Lyons' Medical Jurisprudence for India'.
EWENS, G. F. W. (1904) .. .. Insanity following the use of Indian Hemp. *Ind. Med. Gaz.*, Vol. XXXIX. No. 11, November.
OVERBECK-WRIGHT .. .. .. 'Lunacy in India'.
INDIAN HEMP DRUGS COMMISSION REPORT, VOL. II.
REPORT ON THE CULTIVATION AND USE OF GANJA (1893).

DISCUSSION.

Dr. K. K. Ray (Assam): It has been stated that a marked conjunctival congestion is seen in the horizontal vessels of both eyes. Why is it that the congestion is only in the horizontal vessels and how does one account for the absence of congestion in the vessels in the vertical or perpendicular direction ? I have seen some cases where the congestion was general though less marked in directions other than the horizontal.

Rai Bahadur Dr. Chuni Lal Bose (Bengal): What alcohol is to Europeans, Ganja is to Indians ; a predominant factor in the incidence of mental disease. In our mental hospitals, if you make an enquiry, you will find that in a very large number of cases the disease has followed excessive indulgence in Ganja and Charas smoking. As regards the habit of Ganja smoking, so far as I know, it is not prevalent to the same extent among the Bengalees as among the people of the U. P. and the Punjab. There was a time when most Bengalees used a little Bhang leaves in some form of drink mixed with sugar and spices just as we all take tea in the afternoon, but the practice has now, to a large extent, disappeared.

Dr. Mary N. Batchelor (Bengal): What are the psychological effects of hemp, and how can the habit be broken ?

Capt. J. E. Dhunjibhoy, I.M.S. (Bihar & Orissa):

In reply to Dr. K. K. Roy : The congestion of the conjunctiva is general in fresh cases (horizontal as much as vertical), but later on it disappears in the vertical and remains in the horizontal. The reason for this is not known, but I believe it has a selective action on the horizontal vessels. In chronic cases, the horizontal vessels are also injected.

In reply to Rai Bahadur Dr. Chuni Lal Bose : In the Ranchi Indian Mental Hospital only Bengalees and Beharis are admitted and out of 30 per cent of the population suffering from hemp insanity 28 per cent are Bengalees. Besides, statistics show that about 55 per cent of the Bengalee lower classes indulge in Ganja smoking only. The people from other parts of India chiefly smoke Charas and drink Bhang and very little Ganja. Further, Ganja is the cheapest form of drug and is largely indulged in by

The Ranchi Indian Mental Hospital caters for the two large provinces of Bengal and Bihar & Orissa and is the largest and one of the most modern mental hospitals in India It has a population of 1,200 males and 236 females With a view to ascertain the true number of hemp drug addicts amongst the patients under my charge I thoroughly examined the 1 200 male patients and found that a history of the hemp drug habit either in excess or moderation was present in 360 patients, i e , 30 per cent of the total male population Out of this 138 were found to be *suffering from typical hemp drug insanity, mostly of the chronic type, and were* confirmed hemp drug addicts This was corroborated by the following confirmatory factors —

(1) Descriptive roll A document brought by the patient on admission in which the habit of the patient to hemp drugs if any is clearly stated by a responsible police officer of his district after a thorough enquiry from the patient's friends and relatives

(2) By the patient s own statement

(3) By the presence of the peculiar eye condition

(4) The absence of a neuropathic or psychopathic heredity

In the remaining cases hemp was proved to be an exciting cause and the history of habit was corroborated by the descriptive rolls in some and by the patients' own statement in the others, but the peculiar eye condition was present in all The majority of these cases belong to the poor uneducated agricultural and labour classes and only 10 per cent belonged to the well to do and educated classes The form of drug commonly used was Ganja Bhang had been used in 15 per cent and in 5 per cent, Charas Of these cases 45 per cent were admitted as criminals with all sorts of charges from murder downwards

Connection of hemp drugs with crime —Excessive or prolonged use of hemp drugs degrades the mind and character of the *consumer and predisposes him to* commit crime in general Thus hemp is one of the most efficient means of increasing the criminal classes in India It is also largely consumed by bad characters to fortify themselves for crimes Bhang is a very useful weapon in the hands of criminals for looting ornaments from women of easy virtue and the sweetmeat Majum for looting ornaments from children It is also a known fact that some persons fortify themselves with an excessive dose of Ganja, generally mixed with Dhatura seeds (*Stramonium*), for premeditated murders whether for gain, grudge or revenge Similarly, sudden or prolonged large doses of hemp usually mixed with Dhatura seeds (*Stramonium*) are responsible to some extent for such serious crimes as unpremeditated murder running amok, grievous hurt, rape, etc , which occur daily in a vast country like India

Conclusions

(1) In India hemp drugs, whether taken in excess or moderation over a prolonged period, produce a special form of mental disorder which is characterized by a definite train of symptoms which is fairly uniform in character

THE MENTAL FACTOR IN DISEASE.

(BEING AN ACCOUNT OF SOME CASES CURED BY SUGGESTION.)

BY

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Macbeth :—'*How does your patient, Doctor?*'
Physician :—'*Not so sick, my Lord, as she is troubled
with thick-coming fancies
That keep her from her rest.*'
—Shakespeare—Macbeth, Act V, Sc. iii.

As we stand upon the threshold of a new era in Medicine,—an era in which, among other great changes, it will be universally recognized by the medical profession that the human body and its various ailments, tropical as well as non-tropical, cannot be adequately and scientifically studied and relieved, or cured, while we dissociate psychology from physiology and pathology,—I am tempted 'to rush in where angels fear to tread,' and to attempt, within the limits of a short paper, to draw the attention of this Congress to the subject of psychotherapy, by the detailing of a few cases of physical, mental and mento-physical ailments in which suggestion-therapy has produced outstanding and gratifying results in my own personal experience and practice in Bombay.

The literature of psychology, in all it branches, is extensive and ponderous, so that it would be impertinent for me to endeavour to dilate upon the theoretical aspect of the subject.

While in perfect agreement with the old adage that 'a little knowledge is a dangerous thing' I would venture to put forward a rider to the effect that '*No knowledge at all is still more dangerous.*'

Confronted with the practical and lasting benefits obtainable by the resolute practice of iterative and consistent suggestion, in conjunction with surgical, medical and other therapeutic measures, and even in cases where these and all other methods of treatment have failed over a period of years, we cannot afford to ignore, in our daily work, a therapeutic method of increasing importance.

By psychological methods, we can help in the re-establishment of every bodily function which has been put out of temporary commission by disease,

the poorest classes of Bengalees who cannot afford to smoke Charas which is the privilege of the rich

In reply to Dr Mary N Batchelor The drug is a direct cerebral poison No other parts of the body are effected as much as is the brain The pyschological effects of hemp have already been noted in my paper in detail To break the habit the drug must be stopped at once As it does not produce any abstinence symptoms like opium, morphia or cocaine this practice is very easy It is however very difficult to break the habit but suggestion and social hygiene have been successful in some cases

Psychotherapy finds a most valuable field in the correction of vices, the curing of various drug habits, the development of latent talents, and in correcting such morbid psychasthenic conditions as the various phobias, obsessions and associated conditions, despondency, and other morbid mental manifestations. Not only are results obtained in so-called functional and psychoneurotic conditions, such as headache, migraine, neuralgias, rheumatism, impotency, certain forms of asthma, writer's cramp, constipation, nocturnal enuresis, inebriety, drug habit, hysteria and monomania, but excellent results are obtained in various gynæcological diseases of a functional character and in perversions and weakness of all kinds; also in pernicious and other forms of anæmia, chronic malarial infection and for the relief of the morbid psychic element accompanying organic valvular lesions and to assist in the functioning of the 'disabled heart.'

We cannot dissociate physiology from psychology. They are mutually interdependent,—nor can we in the use and practice of suggestion, lay down a definite boundary between 'organic' and 'functional' disease.

Criticisms often levelled at suggestion are that it can affect only the weak-minded or neurotic, that it may relieve but *cannot cure*, and that it cannot have any influence, or give results, in organic disease. In reply to the first criticism, I need only say that it is with reluctance that I undertake treatment in such cases as they are difficult to deal with, early and decided improvement being most often obtained in the cases of hard-headed business men who can weigh and consider the reasons set forth by the physician for his confidence, and calmly undertake, after due consideration, to give the treatment a 'fair chance.' In such cases one can almost guarantee success in suitable circumstances.

Let us examine the other charges :—

(1) A young woman, brought by the League of Mercy of Bombay for treatment of kleptomania, etc., was seen by me to have on her elbow an ulcer over one inch in diameter. This ulcer had resisted treatment for about three years. That important organ, the skin, had been destroyed by disease over an area as large as a rupee. Patients who come for psychological treatment, *as a last resource*, are always provided with a sheaf of prescriptions, and with a multiplicity of diagnoses. This patient was no exception to the rule, and she had recently undergone a course of sulphur applications following a theory of scabious ulceration, and a course of antimony on the diagnosis of 'oriental sore.' I made no change in the treatment which had had, without result, been adopted for some time past by the sister in charge of the case, namely, application, twice daily, of moistened boracic lint; but proceeded to give suggestions of mental and physical improvement to the patient in the 'suggestible state.'

Next morning, the pale, bleeding, unhealthy granulations had assumed a healthy red, non-exuberant appearance, to which fact the sister drew my attention on her arrival. The ulcer had healed over on the tenth day, and the skin was strong in three weeks, while the mental abnormalities, such as kleptomania,

accelerate the healing process, quiet nervousness, remove anxiety, prevent or relieve pain, promote sleep, instil hope—thus producing conservation of mental and physical energy and an all round increase of vitality and power of resistance

To be frank, I find myself in the study of psychology, lost in verbiage, and the main result of a particular literary investigation is, as a general rule, an attack of cephalalgia , though, fortunately, it is an axiom that '*Suggestion can undo what suggestion has done*' It will be the better way, therefore, if without wearying you with theory, I put forward as the basis of treatment by suggestion, which is the branch of psychotherapy with which this paper deals, the postulate of mental duality, with which we are, nowadays, all more or less familiar

The subconscious, or involuntary, mind accepts suggestions in the absence of criticism by the conscious This is easily demonstrable, and we take advantage of the suggestibility and receptivity of the subconscious in suggestion therapy

Criticism or 'hostility' *may arise* to prevent the reception and realization of the suggestions, even when the suggestions are for the good of the patient, and *will always arise* if and when suggestions are given which are contrary to the patient's conscious fixed ideas, or express wishes, or which are opposed to his, or her, moral prejudices Herein lies the perfect safety of suggestion therapy in qualified and competent hands, in spite of such 'evidence' to the contrary (e g , 'Trilby,' and the cinema) as is paraded by the unthinking and 'many-headed multitude'

The practitioner who uses suggestion therapy in his daily work meets with powerful opposition not only from 'the man in the street' but from many members of his own profession This opposition is, in all cases, the outcome of ignorance

The man who says 'I do not believe' is always a man who does not know, and who in too many cases, does not want to know To the man who knows, because he has seen, the influence of suggestion is usually powerful and always beneficial By successful appeal to the subconscious we get results in acute as well in chronic disease

By its employment we quiet nervousness, promote sleep, aid digestion, encourage secretion and excretion, and through a re establishment of perverted functions, bring about an increased resistive power of every cell of the elements comprising the complex mechanism of the entire animal physiology

With its skilful employment, the physician himself becomes one of the most potent aids in his therapeutic armamentarium

To speak in general terms, he can employ such measures to retard the pulse, to inhibit pain, to lessen temperature, to modify hæmorrhage, to stimulate functional activity, and, in consequence of its employment as a physiological stimulant, to make new blood and to increase the resistive power of all normal cellular elements to the onslaught of pathological processes

(9) A case of nocturnal incontinence of urine in a youth of 18 years was recently checked at the fourth treatment. The only complaint now is frequency of micturition, and it has been explained to the patient that his disease is cured, while the development and 'training' of the bladder musculature, so that a normal amount of urine can be retained, is a question merely of time and 'mechanics.' In this case 'bed-wetting' had taken place 4, 5 or 6 times nightly since birth. All treatment, including circumcision in childhood, blistering, and most of the drugs in the pharmacopœia, including large doses of the inevitable atropine, had completely failed during the 18 years of the boy's life, and when he was brought to me he was suffering from a very obvious 'inferiority complex.' This has quite cleared up with the relief of the condition and he is now bright-eyed, happy and self-confident—a very rapid result, physical and mental improvement progressing *pari passu.* A slight set back obviously due to his mother's death has not disheartened him, and he is on the high road to complete cure.

(10) A business man, aged 35 years, had resigned his post and locked himself into his bedroom, because he feared assassination by the numerous Pathans who, he said, were continuously 'dogging his footsteps' in the streets of Bombay. He had worried the police department for police protection during the previous six months and had made frequent appeals to the Judges of the High Court at Bombay. I was called to certify him as insane and brought with me the necessary documents, but, on examination of the patient, I asked permission of his brother, a medical man, to treat the case by suggestion.

I first saw this patient, who had been suffering from psychasthenia, with delusions of persecution and hallucinations of sight and hearing for over six months, on a Tuesday afternoon. At my second visit, Wednesday, he agreed to cancel his resignation. On the morning of the day on which I paid him my fourth visit, Friday, he had gone alone into the city to look for orders; on Sunday he went for a long motor drive, and resumed full work on Monday morning. I saw him *only five times*, on consecutive days, nearly three years ago and there has been no relapse. The pitiable condition of this patient who, during six months, had caused great distress in his family and anxiety amongst his friends, with considerable financial loss, improved at the very first treatment, which lasted less than ten minutes, his own words being 'A weight seems to have lifted from my head.'

(11) A boy, aged 12 years, sent to me by the Children's Aid Society was cured of enuresis by a *single treatment* which lasted about five minutes. Before treatment there had been 'bed-wetting' twice nightly. The psychological effect in this case was striking and immediately apparent. The boy had been mischievous and idle. He is now obedient and industrious, and has been restored to his father who 'used to have no control over him.' The matron of the Remand Home who brought him for treatment, also brought, walking through the crowded streets of Bombay, two other youngsters who had been treated by me (12 and 13).

lying, irritability laziness etc disappeared from the very beginning of treatment by suggestion There was no question here of improvement being the result of stoppage of 'meddlesome treatment' All active treatment had been abandoned in the case of this ulcer some time before she came to my office

(2) A case of eczema of both hands which had resisted medicinal local and constitutional treatment for *three years* was completely cured in *three weeks* improvement being apparent a day or two after the beginning of treatment by suggestion

(3) A case of nervous vomiting which had lasted $2\frac{1}{2}$ years, complicated by insomnia for the past year treatment consisting of permutations and combinations of bismuth morphia and the ubiquitous bromides, was *cured in a single treatment* by suggestion

(4) A case of obstinate insomnia and acute melancholia, which had lasted for several months, was completely cured by the first treatment The condition had made the patient useless in his office, and he was in imminent danger of compulsory retirement

(5) In this mental case, after his recovery, the patient by order of his manager sought treatment for a chronic diarrhœa which had lasted for over a year The condition cleared up almost at once, though he had been under treatment for sprue There has been no relapse in the past eighteen months

(6) An ulcer the size of an eight anna piece on the ankle of a footballer, which had resisted all treatment, had confined the patient to bed for six weeks and was getting on his nerves' was healed by suggestion in four or five days

(7) I was called one Monday afternoon at 2 P M to see a young European woman who had been suffering from severe hæmorrhage (menorrhagia) since the previous Thursday She was blanched, terrified and surrounded by a frightened household She also complained of a severe occipital headache' and said that she felt 'as if her head would burst' She had taken several tabloids of aspirin without relief

Under the influence of suggestion the headache disappeared *in a few moments* and the hæmorrhage began to stop' before I left the house, in which I stayed less than half an hour, while the psychic effect was no less remarkable the patient smilingly declaring that she was 'no longer afraid, and would soon be all right' I said to her husband, 'If bleeding still continues, telephone to me at dinner time, and I will run over and give a hypodermic injection of ergotinin, as she cannot afford to go on losing blood' The telephone call did not occur and I saw the patient next day—'all right'

(8) In a case of migraine of 14 *years' standing* there has been but one 'sick headache' since treatment by suggestion was first adopted six months ago Previously there was daily headache, with a weekly attack of nausea, vomiting and extreme physical and mental prostration The patient, now happy and hopeful, had previously declared that 'life was not worth living'

(17) The wife of a Muslim *Mullah*, who had suffered from severe pain in the ear for over six weeks, was quite relieved in a few minutes by suggestion, her own words being '*ek buri chiz jo andar thi, woh nikal gai.*'

The *evil thing* which had *gone out* was excess of blood in the affected area. Let the sceptic who laughs remember that an idea, an impression made upon the mind, an emotion, such as fear, or anger, can empty or flush the facial capillaries, as is recognized in the ordinary expressions of our every-day speech :—'*He grew white with fear,*' '*He reddened with anger*'—the vaso-constrictors and vaso-dilators being regulated by the sympathetic through the working of the subconscious.

(18) I was called to see in one of the city hotels, a lady whose temperature was 105°F. in an attack of malaria. She said, 'I do not mind the fever, but I must have something to relieve my terrible headache. I have not slept for 48 hours.' I prescribed for her fever, but removed her headache *in less than a minute* by suggestion, to her intense relief and her husband's amazement. She slept the whole night and there was no return of her headache.

(19) A police officer came to the hospital one Saturday afternoon with his face swollen up as the result of a carious tooth.

He said, 'I can stand it no longer, I have not slept for three nights.' I said, 'The dental surgeon has left, you must wait until Monday, but'—as he started to protest—'meanwhile there is no need for you to suffer pain.'

Too polite to laugh, he looked incredulous, but a few minutes later he was sitting in the outer office, smoking and laughing, entirely freed from pain and highly amused at the simplicity of the treatment. He said, 'I have had three days' and nights' agony unnecessarily.'

(20) A patient, aged about 37 years, after a severe enteric fever, in the course of which headache had been relieved and sleep induced by suggestion, resumed the cigarette smoking in which he had indulged to excess since his school days. I remonstrated with him, and pointed out that his heart muscle, like the rest of his body, had been considerably deteriorated, temporarily, by the prolonged poisoning of the enteric and that he was very unwise to smoke fifty cigarettes daily under the circumstances. He said, 'I cannot stop smoking'; and I proposed that we should see how suggestion would help. Two weeks later, he said, 'It is very strange that when I automatically take a cigarette and light it, I do not enjoy the smoking as I always did before. Now *my mouth fills with saliva* and I throw the cigarette away.' Here was the wide-awake subconscious carrying to fruition and realization the inculcated idea—an interesting example of *Teleology*.

(21) A highly hysterical young woman was brought to me by the League of Mercy because she 'would not eat.' She said, 'This method of yours will do me no good, I am *too strong-minded.*' She, after some persuasion, in the course of which I insisted that I had no intention of interfering with her 'strong mind,' or with her will-power, consented to listen to me for a few minutes, during which she giggled hysterically at intervals.

One of these, aged 12 years, had three times, and the other, aged 9 years had twice absconded from the Home The matron said that they were now 'as good as gold' and that 'a week ago she would not have dared to risk bringing them through the streets

(14) A young man employed in the Eastern Telegraph Company, Bombay, who came to me for treatment in December 1925, complained that he had had daily headaches for several years, and feared that he would be compelled to leave his employment The 'headache habit' was broken at the first treatment and now in August 1927, he says that since he took up treatment by suggestion 'he does not know what it is to have a headache' I need hardly say that the usual gamut of analgesic and tonic combinations had been consistently tried over a period of years

(15) The Muslim steward of a Bombay club aged 60 years was sent to me for relief of *constant pains* in the right shoulder, following a fracture of the right collar bone eight months previously

The secretary of the club stated that the patient was wasting away' and requested me to do what I could for him I satisfied myself by consultation with the old gentleman's own medical attendant, and by examination of the patient and his X ray plates, that I was dealing with a painful mental impression The pain disappeared in a few moments under treatment by suggestion on Friday afternoon On Monday the patient returned in a most despondent mood He said 'I thought I was cured, I had no pain whatever on Friday, Saturday and Sunday For the first time in 8 months I have slept well but since I woke up at 7 o'clock this morning the pain is as bad as ever'

Pain was again removed in a few moments I said 'suggestion, being a *common sense* and *natural* method of treatment, will not perform miracles You must come to me daily for treatment, until the *pain habit* has been broken' He came on Tuesday and Wednesday for treatment, being meanwhile free from pain On Thursday he came in a most happy frame of mind, and said, 'I do not wish to waste your time, as you are a busy man I need no more treatment *I am cured*' Turning back as he neared the door, he made the nicest remark that has ever been made to me about suggestion —'*I knew our Mohammedan saints could do this sort of thing, but I never heard of a European doing it before*'

(16) About a week later he sent me a typewritten letter brought by an aged Goanese club waiter, who had tied a bandage over one eye The letter ran — 'Honoured Sir, I send our old club servant F——— who has suffered severely from *half headache* (sic) for a long time *Kindly do the needful*, and oblige,—Your humble servant,— M— ——'

Here was an example of shining faith powerful enough to move mountains In a few minutes I had succeeded in 'doing the needful,' for the old man said, 'I can see now I was blinded with pain The pain has gone', and he too returned to his work, grateful but mystified

Reference is often made, in the discussion of the subject of *suggestion*, to *imaginary ailments*, *imaginary pain*, etc., as if these were conditions not deserving of sympathy or of serious consideration by the medical man.

A patient suffering with an *imaginary pain*, dismissed as *neurotic*, goes from physician to physician without relief, or rather with a downward tendency towards permanent invalidism drenched with drugs usually of a sedative (i.e., depressing) nature, as a self-centred trial to his family and his friends—a source of revenue to the unscrupulous and the charlatan.

I may be pardoned for dwelling in detail upon a typical case in which the patient's *imagination* had made him one of the most unhappy men in India for over six months.

An old friend of mine, a well-educated, ordinarily most cheerful, member of a famous service of world-wide activities had, early in 1926, developed 'a pain in his heart.' In the course of his business engagements he is called upon to travel long distances by train over certain periods of the year, and, during 1926, he had sought the advice of several physicians in different parts of the country. While giving definite opinions that there was 'nothing wrong with his heart,' none had succeeded in relieving either the pain from which the patient suffered, or his anxiety with regard to his future. On his arrival in Bombay, in November 1926, he called to see me and I was surprised at the great change for the worse which was apparent since I had last seen him about two years before. He stated his case, and expressed the gloomy opinion that he was doomed to spend his impending leave out of India in a London nursing home.

He was greatly depressed, and was, in all respects, a different man from the cheery companion of other days. He said, 'I cannot afford to have anything happen to me. I have a wife and children to think of.' I examined his heart carefully and, after a general examination, with a history of his condition since I had last seen him, I said, 'I agree with my colleagues that there is nothing whatever wrong with your heart, organically speaking, and that you are frightening yourself without cause.'

He replied somewhat testily, 'I admit that I am frightened but there is a cause. What is the good of telling me that my heart is all right? It is not all right. I am always conscious of it. There is always discomfort or actual pain. I can think of nothing else. I was told to stop smoking. I have done so, and the pain continues. I have given up alcohol on medical advice, and the pain continues. And now you tell me the same as the others. I can see nothing for it but to spend my hard-earned leave in a nursing home.'

I replied, 'The pain from which you suffer may have had its origin in an attack of dyspepsia, a muscular spasm, or some such cause as flatulence. The point is that you *think* your heart is diseased, and a more important point is that *you are wrong*. If I can remove your worry, and this false idea, you will be *ipso facto* cured.'

A few days later the sister who had brought her returned with another case for treatment and said, 'Our young friend is eating well daily She, however, protests indignantly against any statement that this is the result of suggestion She says that she is eating, *just to please the sisters*, though previously we used to spend much time in trying to persuade her to take her meals' It is interesting to note that the conscious usually finds an excuse or reason for the carrying out of ideas implanted in the subconscious

(22) A young woman, a teacher by profession, who had two years ago been cured of insomnia and mental depression by suggestion, with a corresponding improvement in her general health, complained of dysmenorrhœa, pain being so severe for two days of the menstrual periods as to necessitate stoppage of work and loss of salary Since the first and only treatment for this specific object, about six months ago, the menstrual periods have been entirely free from pain, the dysmenorrhœa having been of the spasmodic or 'neuralgic' type for over eight years i e, since the attainment of puberty

(23) A few months ago, I was called, in consultation, to see a case of obstinate pleuritic pain which had lasted for several weeks in a young woman and had resisted all efforts at relief At the time of my arrival, great pain was complained of on deep inspiration, though fever and other symptoms and signs of inflammation had subsided In less than a quarter of an hour, under treatment by suggestion, deep breathing was performed without discomfort This freedom from all pain lasted for several hours

At my second visit next day, pain was present, but to a much smaller degree, on deep breathing, but this pain was quickly removed, the patient breathing fully and freely at my request, at first doubtfully and fearfully and later with complete confidence I am informed by the medical attendant that convalescence proceeded without further trouble

What can be more 'organic' than a neoplasm such as a 'wart'?—and yet there is hardly a village in Europe which does not boast of a 'wart' curer who may be the postman, the cobbler, the blacksmith, or the local 'wise woman'

The 'charms' such as a slice of fat bacon applied to the new growth, and later buried in a stable—the hair of a red haired man—the saliva obtained from the mouth in the morning before food has been taken, etc —produce the desired result—the wart or warts, disappear! It is a perfectly simple instance of what the psychologists call '*Teleology*'

An appeal is made to the *imagination* The subconscious mind brings about the result by orthodox and specific physiological expedients

The blood vessels which supply the neoplasm with nourishment contract, and the wart perishes from inanition! *Voila tout!* It is the mental machine of the sufferer which has performed the seeming miracle—not the postman, the cobbler, the blacksmith, or the 'wise woman,' who merely act as agents of *hetero-suggestion.*

He replied, 'He arrived in Bombay in an alarming state of ill-health and depression. He was absolutely useless in the office, and could not clear up what had to be done before he left India on leave. In the afternoon, he decided to go to see you. Half an hour later, he came in smiling, tackled a desk crowded with work, which he finished in a couple of hours—work which he had funked since his arrival, and he ended up the day by having the large safe cleared out and arranged. He left for England in high spirits, to enjoy his holiday. The change was little short of a miracle; though, to be perfectly frank, everyone in the office was highly amused at the idea that he had been "cured" by suggestion.'

Four months later, I met the returned holiday-maker in the street. I asked, 'Well, did you go to the nursing home?'

He replied, 'nursing home be d——d. I have not even seen a doctor, or thought about my heart, since the day I left your office. I am quite all right, and enjoyed every day of my leave.'

He returned to Bombay for a day or so five months later, and called in to ask me to a dinner at which he was the 'life and soul of the party,' making everyone laugh at his humorous description of his fears and forebodings during the greater part of 1926.

Ex uno disce omnes.—Here we have definite proof of the possibility of *making an impression on the mind*, by taking advantage of the suggestibility of the subconscious.

'To remove fear,' writes Davis, 'to instil hope, to secure the beneficial effect that is produced on the body by unexpected happiness, for instance; to calm the stress and turmoil of an overwrought mind, is one of the highest and noblest aims of a physician, and if, by his personality, and by suggestion, he can achieve this result, carping criticism leaves him calm and confident.'

Suggestion can do this and much more than this, and by the consistent and persistent use of suggestive therapeutics, the physician can with confidence, in a large and varied number of cases, within the wide-flung bounds of reason, human possibility and common-sense, give a proudly affirmative reassuring reply to the heart-broken appeal of the overwrought Macbeth—

'Can'st thou not minister to a mind diseased?
Pluck from the memory a rooted sorrow;
Raze out the written troubles of the brain;
And with some sweet oblivious antidote,
Cleanse the stuff'd bosom of that perilous stuff
That weighs upon the heart?'

since it is even more true in these modern days of stress and strain, physical and mental, when the struggle for existence is greater than ever before, when the world, not yet recovered from the latest cataclysm, seems to be directing all its energies towards another, while the search for pleasure and profit grows

He replied, 'You refer to this new method of treatment, about which you spoke to me a couple of years ago—suggestion. I don't think it will do me any good.'

I answered, 'That is the opinion that is offered by the great majority of patients to whom I propose suggestion as suitable to their cases. That is due to the fact that psychology has been neglected as a remedial agent, and public opinion is not educated. In fifty years from now, psychotherapy will be recognized as applicable, in varying measure, to all forms of disease. I do not ask you to believe. That would be too much to expect. I ask you only to listen to me, after relaxation. There is not the slightest benefit to be obtained for you by my talking to you in your present tense and anxious state of mind. Just lie down on the couch, make yourself as comfortable as possible, relax all your muscles, close your eyes, and if you can subside into a sort of "brown study," not bothering at all about me, or about what I say, so much the better.'

He lay down, obviously sceptical and rather inclined to laugh at the proceedings.

When he had disposed himself comfortably on the couch, I said, 'You are now in a better condition to receive suggestions. I do not want belief, but I do want absence of active hostility. Keep an open mind on the subject. Don't *try* to do anything. Remain passive. You can if you wish try to believe that I cannot afford to bluff on this subject—but ordinarily *effort and suggestion* are diametrically opposed.'

By this time, he appeared to be 'settling down,' and I impressed upon him the absence of organic disease of his heart, and insisted that the pain from which he suffered and which was causing so much anxiety, was merely a mental impression which had now no physical basis.

I then asked him to rest for a few minutes, after which he was to sit up, and tell me candidly how he was. To my great disappointment, he said, 'I am now convinced that this treatment will do no good in my case. I am just as depressed as when I came here, and my pain is as bad as ever.'

I said, 'If your pain has gone by to-morrow, you need not return, as I know you are very busy. If you are still in pain, come to see me at the same time to-morrow afternoon.' He arrived next day, and I said, 'I must assume you are still suffering from pain, since you are here.' He answered, 'I left your office yesterday more depressed than when I came in. I decided to walk back to my office. As I walked, my pain began to lessen, my depression disappeared, and I *literally felt my shoulders going back*. By the time I arrived in the office I was perfectly comfortable for the first time for six months, and I have had no return of pain. Your system is sound. I am cured.'

I repeated the curative suggestions, and he left Bombay next evening—his own happy self once more. A few days later, I met the officer who was doing his work during his leave, and who said to me, 'What on earth did you do to J——?' I asked, 'What do you mean?'

REPORT ON A CASE OF COMMUNICATED INSANITY,

BY

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Communicated insanity is a very rare disease, only a few cases having been reported in textbooks and mental hospital reports.

This is a disease in which a person suffering from paranoia so far influences another person, that the second person comes to have the same delusions as the paranoic himself. Paranoia is essentially a disorder of judgment and is usually called delusional insanity, and the paranoic, who is called the active agent, must be an active, intelligent and persuasive person, capable of inducing the more innocent and easily suggestible individual, who is called the passive agent, to accept his views. The two must have lived in very intimate association as brothers, sisters, husband and wife or intimate friends, living together. The passive agent further should possess some regard and admiration for the active agent. Two or more cases of insanity in one family do not constitute communicated insanity. For communicated insanity, it is essential that one of them must be a paranoic who, by sheer force of superiority of will, must have influenced the passive agent to such an extent as to make him implicitly believe in and accept his delusions. The victim's delusions must be the direct outcome of the paranoic's influence. I have seen only two cases and it is often difficult to find out who the active agent is and who the passive.

The disease being rare, I thought it would be interesting to report on a case of communicated insanity, which has come under my notice in the Government Mental Hospital, Madras.

I have not heard of any case of communicated insanity in which there was more than one victim. The following case is one in which there are four victims and an active central agent.

In this case, there is no difficulty in tracing the active agent R., an active, earnest, intelligent man, well-read and of good education; he was fascinated by spiritualism and the practice of *yoga* and allied subjects, and easily took to them and gradually came to the conclusion that he had attained self-realization. It is not difficult, therefore, for such a person to bring the other members of his

ever keener than it was when the lines were penned by a great 'Psychologist' that —

'The mind is its own place and of itself
Can make a hell of heaven a heaven of hell'

Here then we have a few varied examples of the efficacy of suggestion therapy, not only in so called *functional*, but also in definitely *organic* diseases, acute and chronic, where the mental co efficient is high

I wish particularly to stress the point that not one of these selected cases, or of hundreds of others treated psychologically came or was placed under my care *ab initio* I look forward with confidence to the day when psychotherapy will be considered by the medical profession to be of prime importance in the treatment of disease Suggestion therapy in present-day circumstances, has to bear upon its broad shoulders the previous failures of other methods of treatment The surprising fact is that, in spite of these adverse circumstances, the method has such wonderful results to its credit

consummated. About 1918, his sister became a widow and came to stay with him. She had a severe go of small-pox with the rest of the family and she lost her mental balance.

About 1923, he started initiating his sister and brother into the mysteries of *yoga,* and later his wife and his brother's wife also. He started living with his brother, who is a Government servant, at S. in June, 1925, and has been with him since. While at S., they started *bhajana* (prayers with music) between the hours of midnight and 3 A.M., sometimes in the open yard in front of the house, disturbing the public of the locality. He was also reported to be driving the devil out of his sister, by all sorts of ill-treatment. He credits himself with having cured his sister and brother's wife of their fatal maladies by spiritual healing. He was arrested by the police, certified by a District Medical Officer and admitted to this hospital on 17th April, 1927. He has been writing letters to various public people on various topics, the main theme being reforming the people and the Government (indicating the supremacy of his own self).

On admission.—His appearance was exalted, he was coherent and rational. His orientation and memory were good. Attention was good. Reasoning and judgment were impaired only as regards his delusions. He has various delusions and his conduct is consistent with the delusions. Though he does not expressly say so, he claims to be the Lord *Kalki* (10*th Avatar*), superior to every other being, born for the regeneration of mankind, having psychic powers with capacity to return dead to life, that (by virtue of his superior powers) he is a non-official secret service agent come to observe and mend the irregularities of this hospital; he expects the Government should help him to carry on his mission in life and if it does not do so, he will shatter the British Empire to pieces even as Viswamitra did of yore. He is well informed and can talk and argue intelligently on various subjects. He appears to be a man of determined character and believes that he can will any one to do what he wants. He is in my opnion a good case of paranoia of the exalted type and it can be easily understood what a dominating influence he must have had over the other members of the family.

The Passive Agent.

C. P., clerk in a Government office, aged 39, and of fairly good education. He can talk well and argue. He is married and has no children. He has got a widowed sister who, he says, is also of the same type. He is said to have been religiously inclined from very early years, completely under the influence of his brother C. R. for a long time. He states that he is a complete servant of his brother, who is the 10*th Avatar* (incarnation), Lord *Kalki,* born for the reformation of the world, and he believes that his brother has enormous powers, physical, mental, spiritual, etc., capable of returning the dead to life and of destroying the whole world, and that his brother is come here for the regeneration of the mental hospital, to convert it into a universal brotherhood, and if they cannot bring us to their views. woe be

family to accept his views and to make them recognize him as their spiritual leader

In a country like India, where family ties are so strong where members of the same family live together even after getting married, and where the people are more spiritually inclined and more easily suggestible perhaps than elsewhere it will not be a surprise to see a son worshipping his parents and elders or a woman worshipping her husband It is no wonder that the active personality of R dominated over the quieter younger brother P Further, this influence of R did not stop with P, but extended to his wife, his sister and his brother's wife, who all have the same beliefs as P and who are all agreed as to the exalted rank of R, and treat him as such

Though only the brother is a patient in this hospital now, I have seen all the three women and talked with them and am convinced that they are also victims to the same delusions and their admission to a mental hospital is only a question of time unless something extraordinary happens

The Active Agent

Name —C R, 42 years

Male —Married 1912—One son 5 years

Family History -Some distant relative on the mother's side reported to be insane Father a well to do pleader died in 1905 Mother died in 1906 Has one brother and one sister—the brother a patient in this hospital

Previous History —No trouble at birth No history of epilepsy Had diarrhœa off and on during the first ten years of life He had a decent education, and took the B A degree of the Madras University in 1909 According to the patient and his brother, the father on his death bed initiated this patient into the secret practice of *yoga*, which he says had been running in the family for over 500 years from father to son He had taken a vow to practice it and had been doing it ever since In life, he had been wandering from place to place, and was at least in a dozen different situations, sticking to none for any length of time, he has often had quarrels with people under whom he worked for some alleged grievance In one instance, he was involved in litigation and talks proudly of all his doings He states that his constant changes were due to the fact that he was in search of a quiet place, where he could have full scope for practising *yoga* He had been a clerk, journalist, assistant to a *yogi* teacher, etc He has travelled far and has read much especially literature on various religious topics Occasionally, he used to preach on the practice of *yoga* Altogether, he has been an eccentric individual

In 1915, he returned home from his wanderings, got full facilities for practising *yoga* and turned himself into a complete ascetic, remaining mute for a few months when he was suspected to be a lunatic by the people of the place He, however, seems to have come back to reality about the end of that year and had his marriage

EINE INJEKTIONSMETHODE DES NERVENSYSTEMS.

VON

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NEUERDINGS haben Worobiew(1), Kondratiew(2) und eine Reihe anderer russischer Autoren eine Darstellungsmethode der feinen Nerven im makro-und makro- mikroskopischen Gebiete ausgearbeitet und die damit gewonnenen Ergebnisse veröffentlicht. Sie gebrauchten für ihre Zwecke ein besonderes Farbengemisch. Ich habe ihre Method ihrer Beschreibung nach nachgeprüft, ohne aber befriedigende Resultate zu erzielen. Der Hauptnachteil dieser Methode ist, dass sich mittels derselben die feinen Nervenfäden auf dem stets diffus gefärbten Grundgewebe nur sehr schwer hervorheben lassen.

Nach allerlei Versuchen ist es mir und meinen Kollegen endlich gelungen, eine befriedigende Nerveninjektionsmethode auszuarbeiten. Die Versuche, den Nerven zu injizieren, sind eigentlich nicht neu(*a*), sondern schon seit langem von verschiedenen Autoren angestellt worden, wegen der damit erzielten ungenügenden Erfolge jedoch immer wieder aufgegeben worden, und so in Vergessenheit geraten. Die Injektion des Nerven ist von der der Gefässe grundverschieden. Während man bei den Gefässen die Injektionsmasse in das praeformierte weite Lumen spritzt, lässt man dagegen beim Nerven die Injektionsmasse durch die minimale Saftspalte vorwärtslaufen.

Unsere jetzigen Kenntnisse über die Saftbahnen des Nervensystems verdanken wir den zwei grossen Anatomen Key und Retzius(3 and 4). Sie bedienten sich zur Darstellung der Safträume des Nervensystems der Injektionsmethode mit gefärbter Gelatinflüssigkeit oder Asphaltchloroform und fanden, dass sich die Injektionsmasse in der Scheide des Nerven diesen eine gewisse Strecke entlang sowohl zentral- als auch peripherwärts begibt. Unseren eigenen Erfahrungen nach sind die Gelatinflüssigkeit und das Asphaltchloroform als Injektionsmasse nicht geeignet. Obgleich ich die Injektion mit Gelatinflüssigkeit für besser als die mit Asphaltchloroform halte, fielen doch die Praeparate damit wegen der unheimlichen Extravasation sehr schlecht aus. Bei vielen anderen Fällen liess die Ausbreitung der Injektionsmasse für unseren Zweck allzu viel zu wünschen übrig.

(*a*) In bezug auf Näheres über die Geschichte verweise ich auf die vorzüglichen Arbeiten von Key und Retzius(3).

to this hospital. Conduct and conversation consistent with the delusions. He had been doing *bhajana* with his brother and the women folk at midnight. When his brother was admitted here, he lost his self control, started beating his breast, *went on complaining to everybody and started singing* the Lord's *songs* in the public streets The magistrate refused to accept his security for his brother, had him observed and certified. He was sent here on 7th June, 1927.

I am very much indebted to the Superintendent of this hospital, for his valuable advice and criticism, also for kindly permitting me to report the case

verschiedene Arzeneimittel ausprobiert. So sah z. B. Ogata bei der Injektion von 3·4 c.cm. 10 per cent ingen Aetherparaffins (flüssiges Paraffin) in den N. ischiadicus einer weissen Ratte (K. G. 120 g.) bei dieser vollständige allgemeine Narkose eintreten, die sich nach etwa 20 Minuten wieder verlor. Die Analgesie begann sehr eigenartig in dem betreffen-den Hinterbeine, schritt in derselben Körperhälfte aufwärts, ging dann auf das Vorderbein und endlich auf das Hinterbein der anderen Seite über, wobei das Tier fast einschlief. Diese eigenartige Ausbreitung der Analgesie scheint mit dem Septum posticum (Schwalbe) zusammenzuhängen.

NACHSCHLAGEWERKE.

(1) Worobiew .. .. Methode der Untersuchung von Nervenelementen des makro-und makro-mikros kopischen Gebietes. Berlin.

(2) Kondratiew .. .. *Zeitschrift f. Anatomie und Entwickl.* Bd. 78, S. 669. Anat. Anzeig. Bd. 61, S. 69.

(3) Key und Retzius (1875) .. *Studien in der Anatomie des Nervensystems, und des Bindewebes.* Stockholm. Bd. I. S.1—56. u. *S. 65*, u. S. 71.

(4) *Idem* (1876) .. .. .. *Ibid.*, Bd. II. S. 97.

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betreffende Bein empfindungslos. Nach der weiteren Injektion von 0,1 c.cm. verbreitete sich die Analgesie auf die Vorderbeine und endlich die letzte Einspritzung von 0,1 c.cm. auch auf das Hinterbein der anderen Seite bis zum Schwanze. Das Tier atmete ruhig und schlief. Nach 10 Minuten kehrte die Empfindung zurück, und zwei Tage später hatte sich das Tier völig erholt.

Wir probierten nun als Injektionsmasse eine Reihe organischer Flussigkeiten wie Aether, Benzol, Hexan, Amylacetat Dekalin u a aus, die sich alle als brauchbar erwiesen Die besten Erfolge erzielten wir jedoch mit Dekalin So konnte ich z B mit meinem Kollegen Yamada vom N peronaeus aus durch Injektion von etwa 25 c cm Dekalin das mit Ultramarin (Oelfarbe) gefarbt war fast das ganze Nervensystem eines mittelgrossen Kaninchens durchtranken und naturlich erst recht die nervosen Zentralorgane (Tafel XLVI, fig 6)

Als ebenso brauchbar erwiesen sich andere Farbenbeimischungen so z B die Gerottasche Injektionsfarbe fur die Lymphgefasse

Wir bevorzugen von unseren Mischungen eine aus 47 5 Teilen Amylacetat 47,5 Teilen Aether, 5 Teilen Olivenol und etwa 10 cm aus der Tube gepresster Farbe Diese Masse lauft beim Einspritzen sehr leicht in den Nerven und passiert sowohl zentral als such peripherwarts sehr weite Streeken Man verwendet fur die Injektion die kaufliche Glasspritze mit feiner Nadel und spritzt durch einen beliebigen Nerven unter leichtem Druck ein Allzu starker Druck ist durchaus zu vermeiden Falls die Injektion richtig gelungen ist, kann man den Nerven entlang das Einlaufen der Farbe beobachten

Bei der mikroskopischen Untersuchung befindet sich die Farbmasse im peripheren Nervensystem in den epi und perineuralen Spaltraumen In den Zentralen Organen trifft man sie hauptsachlich im Subarachnoideal und Subduralraume an

In den Figuren 1—4 (Tafel XLV) habe ich von einem Kaninchen bei welchem von N, ischiadicus aus das Farbgemisch injiziert wurde die Verteilung der Farbmasse auf dem Querschnitte durch die verschiedenen Partien des Nervensystems wiedergegeben In den Zentralen Organen ist die Farbmasse auch in den Ventrikeln zu finden

Yamada injizierte mit der Farbenbeimischung den N vagus einer Seite abwarts und fand die Farbe auch in N vagus der anderen Seite Auch die feinen Anastomosen zwischen beiden Vagi kamen in diesen Praeparaten sehr schon zum Ausdruck

Verehrte Herren Kollegen ich mochte Sie bei dieser Gelegenheit darauf aufmerksam machen, dass es uns nach unseren Ergebnissen nicht unmoglich erscheint, in gewissen Fallen, besonders in Notfallen, von einem peripheren Nerven aus auf entfernte nervose Organe, und zwar sowohl auf das Hirn und Ruckenmark als auch auf die Peripherie, gewisse Medikamente zu applizieren Meine Kollegen Ogata(*a*) und Fujibavashi haben an Ratten und Frosch vom Beinnerven aus

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(*a*) Ogata hat sich hauptsachlich mit Narkotika beschaftigt und ich will hier noch einige Beispiele aus seinem Protokolle wiedergeben

(1) Ratte (K G 80 g)—

Nach der Injektion des N ischiadicus mit 1 c cm einer 0,2 per cent igen Kokainolivenolemulsion war das ganze Korper des Tieres analgetisch Die Amputatio brachii wurde ohne Schmerzausserung des Tieres ausgefuhrt Nach der Operation verlor sich die Analgesie

(2) Ratte (K G 120 g)—

Man injizierte insgesamt 0,3 c cm 5 per cent igen Chloroformolivenoles in den Hinterbeinnerven des Tieres Nach dem Einspritzen von anfanglichem 0 1 war das

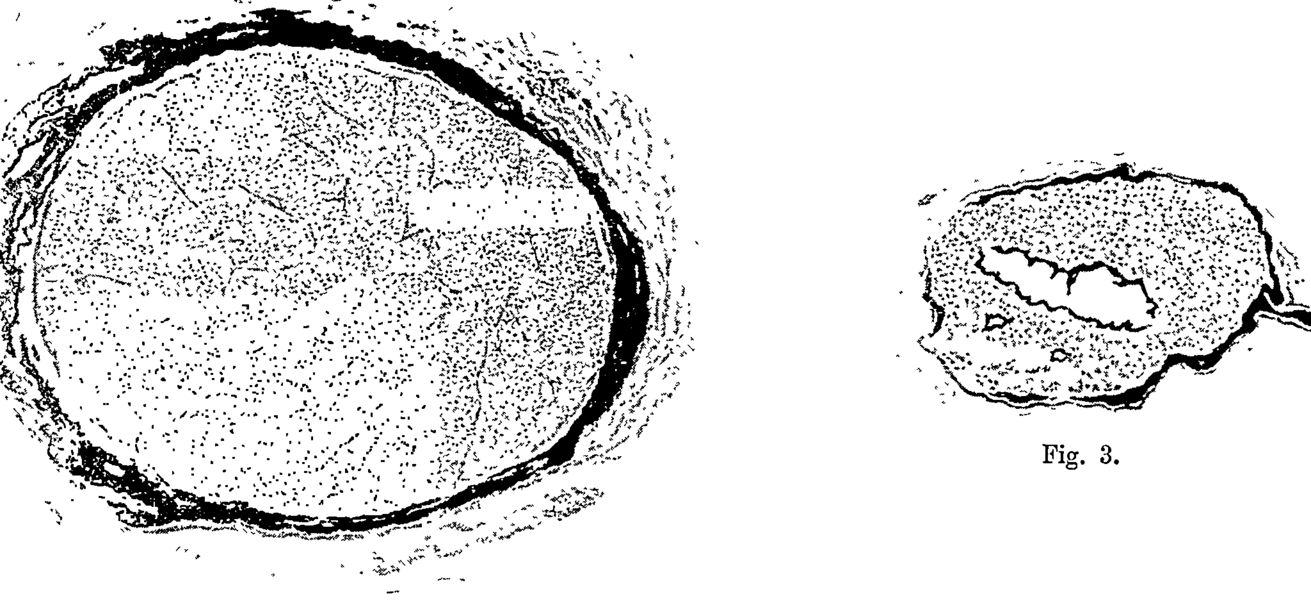


Fig. 3.

Fig. 1.

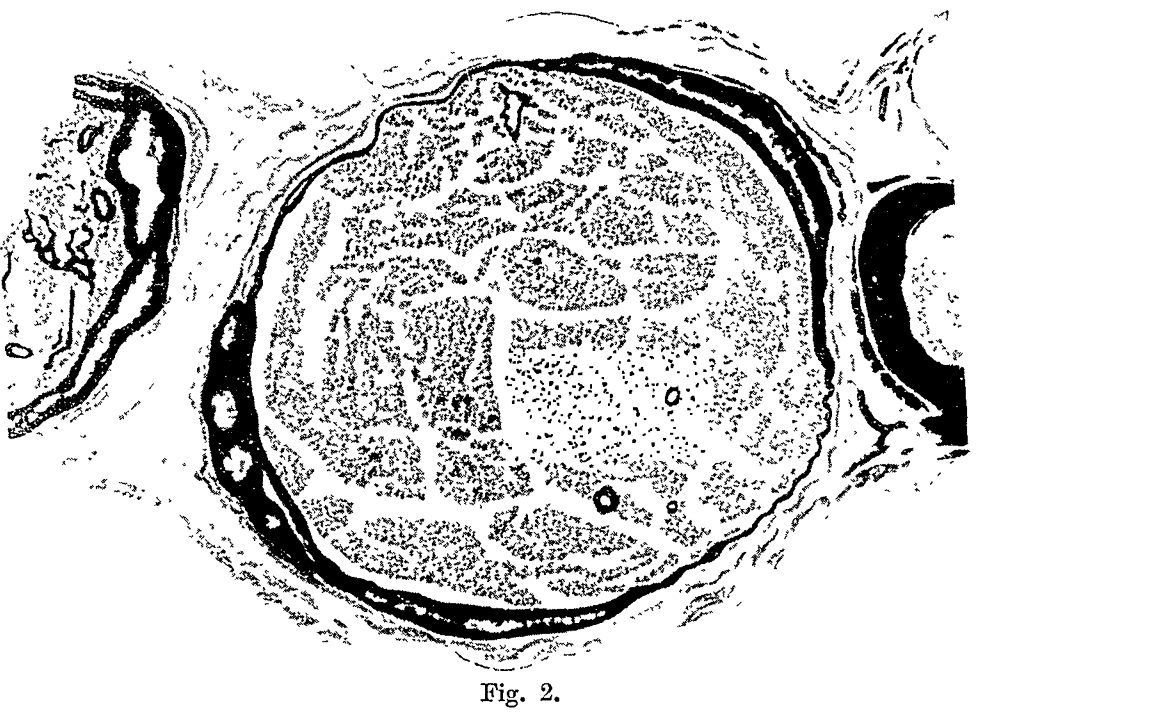


Fig. 2.

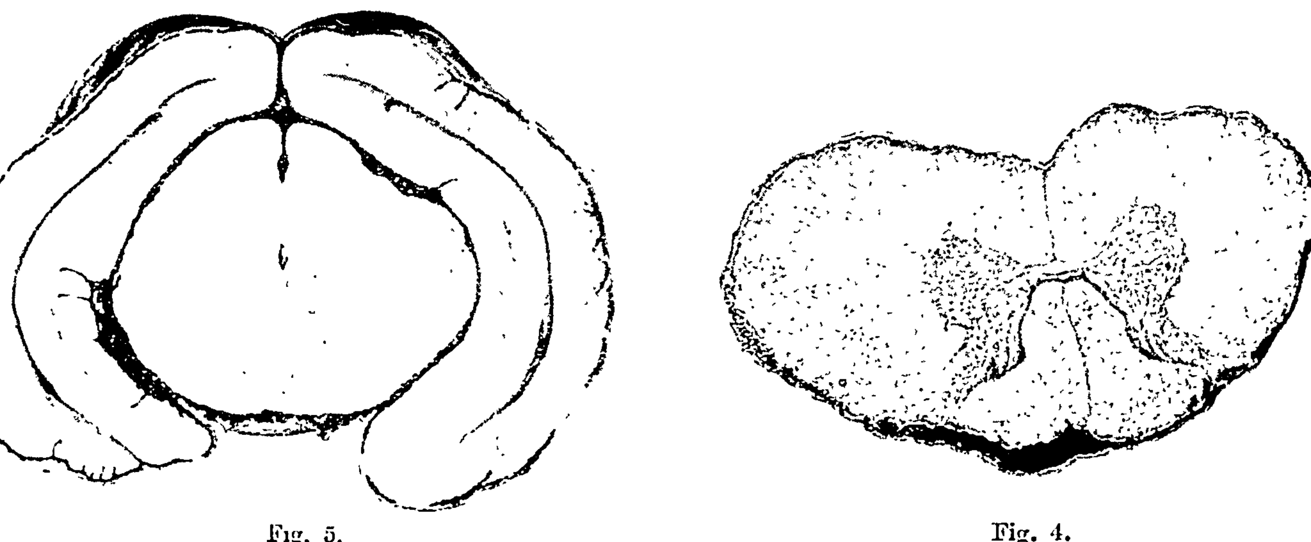


Fig. 5.

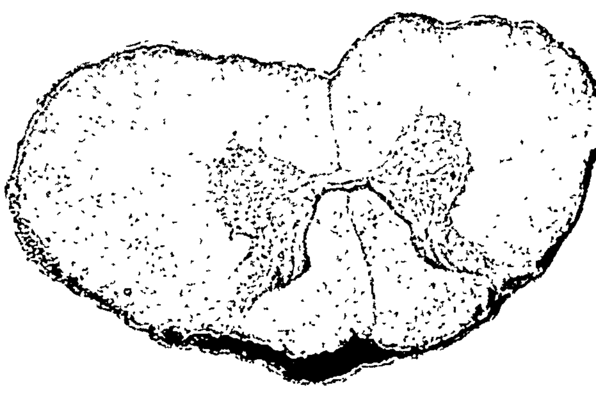


Fig. 4.

Erklarung der Tafel XLVI.

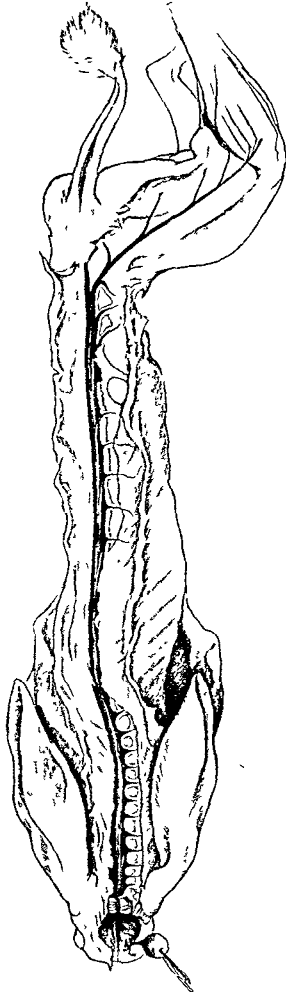
Fig. 6. Ein Kaninchen, bei welchen man den Nerven des linken Beins mit der Farbe injizierte Der Wirbelkanal und die Schädelhöhle sind geöffnet.

ERKLÄRUNG DER TAFEL XLV

Fig 1—4 Die Querschnitte durch die verschiedenen Partien des Nervensystems eines Kaninchens, bei welchem von N ischiadicus aus das Farbgemisch injiziert wurde

Fig 1 Querschnitt durch N opticus
„ 2 „ „ N ischiadicus
„ 3 „ „ N ischiadicus
„ 4 „ „ N. intercostalis.
„ 5 Frontalschnitt durch das Rückenmark

von Beinnerven aus die Farbe eingespritzt wurde ... Grosshirn eines Kaninchens, bei welchem



These are the main points to be investigated, and naturally each case will have its own peculiarities of appearance.

Technique.

I prefer to examine all cases that can stand in the vertical position in the upright screening stand.

Skiagrams should be taken in both positions—upright, anterior, and with the patient lying down (using a Potter-Bucky diaphragm) anterior and posterior. In this way, the maximum of information may be gained.

It must be emphasized that though radiological examination is of the utmost importance, it should never be allowed to replace thorough clinical examination and the usual laboratory tests. *Entamœba histolytica* should be assiduously searched for in every doubtful case.

I have, however, had many cases in which I have been fortunate enough to be the first to diagnose the condition, all other methods having yielded no result.

I propose to give the histories of a few illustrative cases :—

(1) *Case* 1.—M., *æt.* 37. History of evening rise of temperature for six months. Indefinite pains in the chest. No history of diarrhœa. Dysentery a year previously. No clinical signs in the lungs. The case was sent to me by his doctor to see if there was any sign of a doubtful apex. Screen examination showed the right side of the diaphragm almost fixed, raised, and the right lobe of the liver much enlarged. There were no signs in the lungs. A course of emetine caused a rapid cure.

(2) *Case* 2.—F., *æt.* 32. History of an attack of typhoid fever followed by pneumonia. Some weeks after she was apparently well she got a relapse. Evening temperatures rose to 102°. After three days she had a sudden pain in the back which was very severe. Her condition became worse and there were signs of an empyema at the right base. Radiological examination showed that the right diaphragm did not move at all. The right lobe of the liver was enlarged and the right base was opaque as by fluid. This was a case of an amœbic abscess bursting through the diaphragm. It was rapidly cleared up by a course of emetine.

(3) *Case* 3.—F., *æt.* 27. History of dysentery two years before. Sudden attack of pain in the right iliac fossa, which abated. Appendicitis was considered, but as she got, apparently, very much better, this diagnosis was abandoned. While in hospital, however, an evening rise of temperture was noticed –99°–100°. There was also some pain in the right chest. This was examined and a patch of dullness found at the right base. She was sent to me for radiographic examination. I found a typical case of an abscess which had burst through the diaphragm, but apparently slowly, as it was encapsuled. The right diaphragm did not move at all and the right lobe of the liver was enlarged. Emetine again proved the means of a rapid cure.

I could cite many routine cases of hepatic abscess and of hepatitis without an obvious abscess in which the diagnosis has been clinched by radiology, but I hope that the few remarks and illustrative cases given will be sufficient.

Differential Diagnosis.

The main conditions that may cause difficulty in establishing an accurate diagnosis are as below. A careful review of clinical and other data will in the majority of cases however exclude the unlikely ones.

1. *Basal pleurisy with or without effusion.*—The liver is not enlarged, and the dome as a rule is not raised.

RADIOLOGY.

THE RADIOLOGICAL APPEARANCES FOUND IN AMŒBIC HEPATITIS AND MADURA FOOT.

BY

S G GALSTAUN, M R C S, L R C P, D M R E (Cantab),
Calcutta.

AMŒBIC HEPATITIS.

THURSDAY, DEC 8TH, 2 P M TO 4 P M

MUCH has been written from the clinical and the pathological standpoint on the subject of amœbic hepatitis and abscess I do not propose to trouble you with these aspects of the disease, but to confine myself to the very characteristic radiological appearances Curiously enough these are barely mentioned in the voluminous literature on the subject I cannot over-emphasize the importance of radiological examination as a routine in all cases of doubtful or established amœbic hepatitis or abscess I hope that the few illustrative cases I shall bring before your notice will impress you as they have done myself, and the practitioners who have sent them to me, whether at the Medical College Hospital or in private

Appearances

(1) The first, and to my mind the most important, point consists of a careful examination of the movements of the diaphragm I have never yet seen a case of amœbic hepatitis without some limitations of one or both sides of the diaphragm

(2) Examination for irregularities of the diaphragm is also important, roughness or raggedness of outline, opacity at the pulmonary base

(3) Enlargement of one or other of the lobes of the liver is constantly met with

(4) Raising of the arch of the diaphragm on the affected side is seen in many cases

(5) If the abscess has perforated the diaphragm, the appearances seen will be those of a basal empyema, opacity at the base with obliteration of the diaphragmatic shadow.

(6) In cases with a large abscess in the liver, a shadow or clear space may be seen according to whether the abscess is full or empty.

that the foot may easily be cut through with a knife. Clinically the foot is red and swollen. The arch is filled up, the general appearance being that of a tuberculous foot or ankle. Later, sinuses form and exude the characteristic grains. Later on nodules form round the sinuses, the appearance of which once seen cannot be mistaken. It is of little use to have resort to radiological methods for diagnoses in so late a stage as this, when it is obvious to the naked eye, and the only possibility of a cure rests in amputation. It is in the early stages, when only swelling and redness are present that the radiologist is of real use. The appearances are well in keeping with the morbid anatomy of the condition. In early cases they are as follows :—

1. There is a general decalcification, probably mainly due to disuse.
2. A lack of definition, due to the fibrosis, and destruction of joint surfaces.
3. Later on there is destruction of bone with irregularity of outline.

One point I wish to lay some stress on—In nearly every case I have seen the disease seems to begin round about the cuneiform bones.

Differential Diagnosis.

The only condition which can cause similar signs is tubercle. Clinically there are practically no means of distinguishing the two diseases in the early stages. Radiologically there are the following :—In tubercle the disease starts most commonly in the neck of the astragalus and with somewhat less frequency in the lower end of the fibula. Rarely it may start in one of the other bones and extend. In adults the disease occasionally is primary in the synovial membrane, extending to bone later. In all cases we get the peculiar outline of bone variously called 'pencilled,' 'glassy,' 'sketched in,' and so on. This is due to decalcification. In Madura foot though there is decalcification, we do not get quite the same kind of outline, but rather a general haziness. As I have mentioned before, an important point is that Madura foot appears almost invariably to start round about the cuneiforms, which is exceedingly rare in the case of tubercle. Another point of some importance is that we do not get well-defined zones of sclerosis or fibrosis with Madura foot as we do in any chronic cases of tubercle. The disease is more progressive and shows no tendency to natural healing.

The importance of early diagnosis cannot be overestimated, as the treatments of the two conditions are radically different. Whereas in tubercle the best treatment is rest, without any operation, in Madura foot the only thing to do is to excise the affected part. If this is done early, there is very often no disability produced. In the later stages, however, amputation gives the only hope of saving life.

Conclusions.

The radiological appearances of Madura foot are in some respects similar to those of tubercle with certain characteristic differences :—

1. The disease starts externally and invades successively subcutaneous tissues, muscles, joint capsule, synovial membrane and bone,

2 *Empyema* —The history of pneumonia No enlargement of the liver Fluid follows as a rule the curve of Damoiseau No history of an acute attack of pain such as, as a rule accompanies perforation of the diaphragm Such cases should always be confirmed by putting in a needle and examining the fluid withdrawn

3 *Cirrhosis of the liver* —This may cause considerable difficulty in diagnosis especially when an alcoholic history is denied and there is a definite history of dysentery A point of importance is that in cirrhosis the enlargement of the liver is chiefly towards its lower border and it is unusual to get the raised dome so characteristic of amœbiasis

4 *Subphrenic abscess* —There is not much enlargement of the liver seen though there may be an apparent enlargement The history will be of value

5 *Hydatid cyst* —*As a rule the outline of the cyst can be seen* It is well defined and often perfectly rounded

6 *Actinomycosis* —In one case I have seen the appearances were impossible to distinguish from those of amœbic abscess There was limitation of movement enlargement of the liver and raising of the dome In addition an irregular patch of opacity in the right lobe of the liver was evident The diagnosis was eventually made by needling and finding the mycelium

7 *Neoplasm* —Here the history will be of value The finding of a primary centre, of jaundice possibly and the progressive emaciation will all help to settle diagnosis

Conclusions

Radiology is of the greatest value in the diagnosis of hepatic abscess and amœbic hepatitis

The chief radiological signs are —

1 Fixation of the diaphragm on one or both sides or limitation of movement
2 Enlargement of the liver
3 Raising of the level of the diaphragm on the affected side

Madura Foot

I have been unable to find any adequate description of the radiological appearances of this condition I have seen many cases in the last three years and have been struck by certain constant features which will be described

Madura foot is a mycosis caused by the entrance into the foot chiefly (though it may be met with elsewhere) of one of the Madura mycoses There are three main varieties of these, the black, yellow or white, and the red caused respectively by *Glenospora semoni* *Indiella mansoni* and some others, and an aspergillus The fungus gains entry into the skin through a cut or a thorn prick The initial wound heals in the ordinary manner but the fungus grows in the tissues In course of time it attacks the deeper structures, the joint capsule, and synovial membrane Eventually it attacks the bone, and in advanced cases causes so much destruction

UTILITÉ DES EXAMENS RADIOSCOPIQUES RÉPÉTÉS AU COURS DES AFFECTIONS CARDIO-VASCULAIRES DES BÉRIBÉRIQUES.

PAR

E. JOURDRAN,

Médecin-Chef de l'Hôpital de Lanessan. Directeur local de la Santé Publique au Tonkin,

ET

LE MEILLOUR,

Chef du service radiologique à l'Hôpital de Lanessan.

RENSEIGNEMENTS fournis sur les dimensions des cavités cardiaques par les orthodiagrammes.

Pour apprécier les variations de volume du cœur dans les diverses affections organiques ou dans les infections qui peuvent retentir sur son fonctionnement, il faut faire des orthodiagrammes ; on compare les chiffres obtenus avec ceux des barêmes ou avec ceux de séries de témoins choisis de façon à donner une moyenne. C'est ainsi que nous avons eu l'idée de prendre pour comparer les diamètres des cavités cardiaques des béribériques, 3 séries de 10 témoins que nous rangeons dans les trois catégories A, B, C.

La série A comprend 10 annamites présentant à peu près la même taille, la même corpulence, et approximativement le même poids, choisis parmi des malades chirurgicaux et exempts de toute affection organique et autant que possible de toute infection palustre, bronchopneumonique, ou autre pouvant retentir sur les poumons et sur le cœur.

La série B se compose de 10 témoins pris parmi les infirmiers de la Section de l'Annam-Tonkin, recrutés avec les mêmes soins et présentant une taille et une corpulence supérieure à la première série.

Enfin la série C nous montrera des orthodiagrammes de cœurs de prisonniers choisis parmi les plus grands et les plus vigoureux pour que notre moyenne soit faite d'éléments un peu divers ; dans cette troisième série nous avions des chances de trouver des cœurs plus gros que la moyenne en raison des travaux pénibles auxquels

2 It never starts as a bone focus as in many cases of tubercle.
3 The cuneiforms are the seat of election
4 The 'pencilling' of outline seen in the decalcified tuberculous bone is not characteristic of Madura foot

DISCUSSION

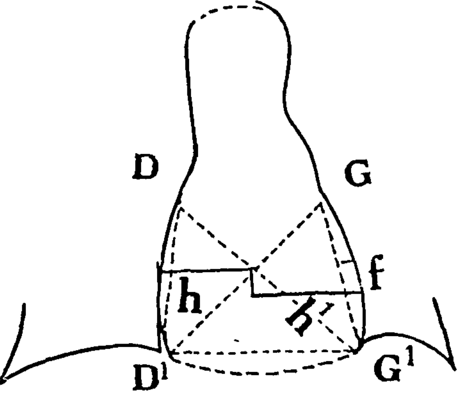
Lieut Col J A Shorten, I M S (Retd) (Bengal)

(1) *Amœbic Hepatitis*—While agreeing in the main with Dr Galstaun's remarks there is at least one condition which has not been mentioned, viz, subphrenic abscess which, if it arises from the perforation of a hollow viscus, is recognized by the collection *of gas below the diaphragm Other collections of fluid below the diaphragm* such as that occurring in ascites must also be considered Again growths of any of the subphrenic organs may result in elevation of the diaphragm In such cases a general survey of the clinical, bacteriological and other available evidence must be made in attempting to arrive at a conclusion

(2) *Madura Foot*—Decalcification of bone occurs in any condition which leads to disuse of the limbs Radiological appearances in Madura foot are not characteristic when taken alone, but when taken in conjunction with the clinical appearances may be conclusive As regards treatment much benefit and, in some cases, complete cure may *result from medium deep X ray therapy given in fractional doses*

avec des sujets sains de même indice de Pignet donne déjà une appréciation intéressante.

Diamètre :		Chiffre normal : Chez les Européens. Vaquez et Bordet
Longitudinal ..	.. DG^1	12·5
Ventriculaire gauche ..	.. GG^1	7·5
Flèche ventriculaire gauche	.. f	2·0
Diamètre basal ..	.. D^1G	10·0
Horizontal ..	.. $h+h^1$	12·0
Ventriculaire droit ..	.. D^1G^1	12·0
Auriculaire droit ..	.. DD^1	6·0



Les plus intéressants parmi ces diamètres pour l'étude du cœur des béribériques sont :

Diamètre
- longitudinal .. $D—G^1$
- horizontal .. $h+h^1$
- ventriculaire gauche .. $G—G^1$
- ventriculaire droit .. $D^1—G^1$

Des renseignements précis nous sont donnés par l'indice ventriculaire $\frac{D^1G^1}{GG^1}$.

Après avoir dans chacune de nos séries, établi la moyenne de l'indice de Pignet, nous avons également cherché les chiffres moyens de ces diamètres principaux, et c'est ce qu'indique le tableau suivant.

	Séries.		
	A.	B.	C.
Indice de Pignet	de 20 à 34 moyen 26·4	de 15 à 34 moyen 25·6	de 24 à 49 moyen 35·4
D. longitudinal	12	13·2	13
D. horizontal	11	10	11·6
D. ventriculaire gauche ..	7·4	8	7·5
D. ventriculaire droit ..	9·6	9·2	10·9
Indice ventriculaire ..	1·28	1·15	1·4

Les chiffres de la série B, composée d'infirmiers de la Section de l'Annam-Tonkin, âgés de 20 à 30 ans, semblent ceux qui répondent le mieux, au type de cœur normal chez l'Annamite. (Ces différents diamètres correspondent le plus souvent, à une ombre cardiaque, médiane, verticale.)

Ces chiffres moyens nous servent couramment à l'appréciation de nos orthodiagrammes. En ce qui concerne nos béribériques, les dix malades dont nous

sont soumis les prisonniers, des tares et de l'usure qu'ils présentent habituellement, bien qu'en Indochine tous les indigènes des classes moyennes qui sont nourris par l'administration soient en général en meilleure forme que ceux qui subviennent à leur subsistance Mais il nous a semblé qu'il y aurait un grand intérêt à mesurer les dimensions du cœur en fonction de l'indice de Pignet qui s'obtient comme vous savez en tenant compte du poids, de la taille et du périmètre thoracique, et qui sert d'elément d'appréciation pour mesurer l'indice de robusticité des recrues enrolées dans l'armée

Il est évident que cet indice qui a été appliqué par son inventeur à l'étude de la robusticité des soldats Européens, est tout de même operant, a quand même une valeur, toutes choses égales d'ailleurs, pour apprecier la robusticité des soldats indigènes

Il est admis aujourd'hui que le cœur et les gros vaisseaux sont proportionnés à la masse de l'individu, et si nous comparons nos béribériques Pignet à Pignet equivalent dans les diverses catégories de témoins dont nous aurons etudié les dimensions cardiaques, nous aurons, au cas ou le cœur serait manifestement plus gros dans le béribéri, un terme de comparaison sur, en raison des similitudes de corpulence, de poids, de taille, et des eléments disparates que nos trois catégories de temoins apporteront dans la détermination de la moyenne de l'aire cardiaque des annamites.

Il importe de faire remarquer dans la circonstance que seule une étude radioscopique avec prise d'orthodiagrammes pourra nous permettre de préciser les dimensions des diverses cavités endocardiaques et des vaisseaux Les radiographies à moins de les faire à une grande distance , par la deformation que donne le cône de l'ombre en projection sur la plaque, deforment nécessairement les objects projetés et faussent les résultats de l'examen

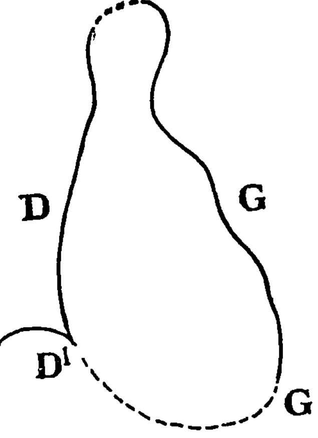
Comme le fait remarquer le Docteur Lutembacher dans son intéressant article sur les '*explorateurs*' *du cœur, on crut d'abord que la radiographie allait nous* donner des renseignements par l'ombre dure du muscle cardiaque tranchant sur la grisaille des poumons , mais il fallut déchanter , les tracés recueillis chez des sujets sains n'etaient pas comparables, les radiations penètrantes forment un faisceau conique dont la pointe est constituée par le foyer d'émission de l'ampoule , le cœur n'occupant jamais la même place chez des sujets différents, la grandeur des contours du viscere devait se trouver inexacte et par conséquent ininterprétable. Cette difficulte est aujourd'hui vaincue, et on peut déceler par les orthodiagrammes avec précision les déformations du cœur

L'orthodiagraphie est donc la meilleure méthode *dans les services hospitaliers* pour apprécier les variations de volume du cœur comme le fait remarquer justement Bordet.

S'il avait été possible de revoir nos malades complètement guéris plusieurs mois apres la convalescence, nous aurions pu comme le fait Bordet, comparer chez le même malade les orthodiagrammes du même sujet en santé ; mais la comparaison

I

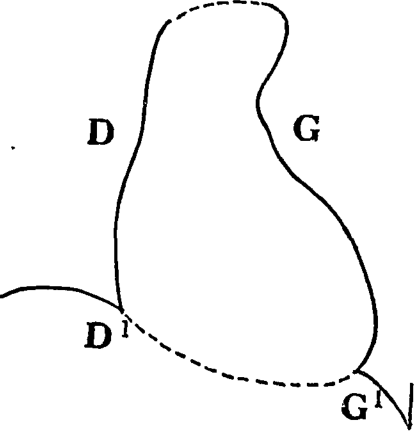
N° Ex : 1943
Inf. N° Mle 4271
Ind. Pignet : 28



Diam. longitudinal	..	12
—— horizontal ..	..	9·5
—— ventriculaire G	..	7
—— ventriculaire D	..	8·3
Ind. ventriculaire ..	.	1·2

II

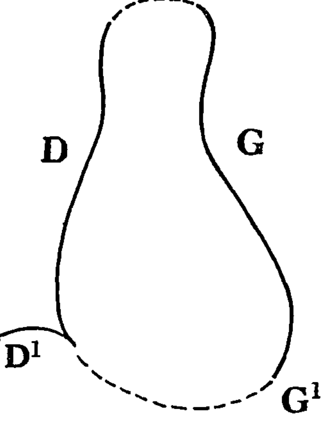
N° Ex : 1944
Inf. N° Mle 4248
Ind. Pignet 27



Diam. longitudinal ..	..	13·5
—— horizontal ..	..	12
—— ventriculaire G	..	8·5
—— ventriculaire D	..	11·5
Ind. ventriculaire ..	..	1·3

III

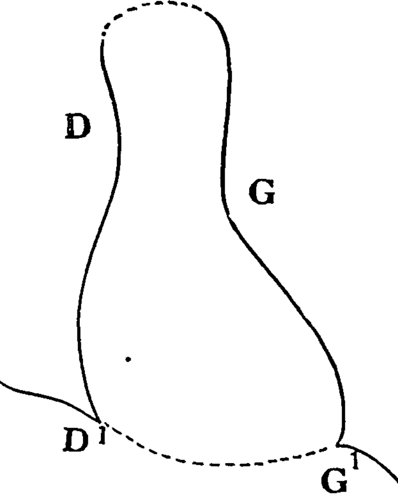
N° Ex : 2015
Inf. N° Mle 3772
Ind. Pignet : 30



Diam. longitudinal ..	..	12
—— horizontal ..	..	9·5
—— ventriculaire G	..	8·5
—— ventriculaire D	..	8·7
Ind. ventriculaire ..	..	1

IV

N° Ex : 2201
Inf. N° Mle 3840
Ind. Pignet : 27



Diam. longitudinal ..	..	14
—— horizontal ..	..	11·5
—— ventriculaire G	..	9·5
—— ventriculaire D	..	11
Ind. ventriculaire ..	..	1·1

[illegible]

Nous avons tenu [illegible] le nombre [illegible] les mesures des différents [illegible] d'avoir dans chaque [illegible] examiner, un terme de comparaison [illegible] les chiffres.

Nous n'avons pu pratiquer que pour deux malades [illegible] Nous avons été empêchés de répéter nos examens [illegible] fait que les malades [illegible] tous assez longtemps immobiles [illegible]

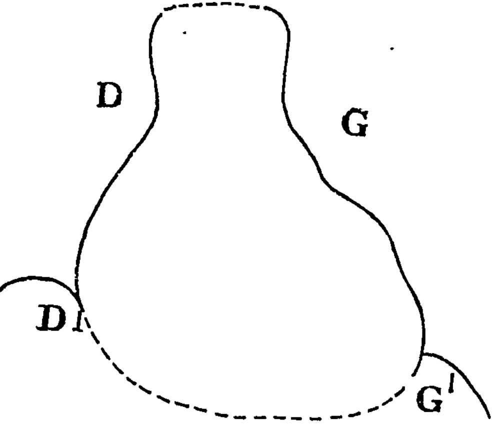
[illegible]

[illegible] par [illegible] Bernard et [illegible] Babbit [illegible]

[illegible] l'individu.

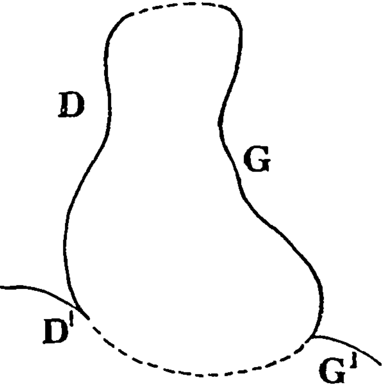
L'augmentation du taux [illegible] les herbivores. [illegible] même [illegible] chez l'homme.

VIII



N° Ex : 2007
Inf. 2953
1er Ex :

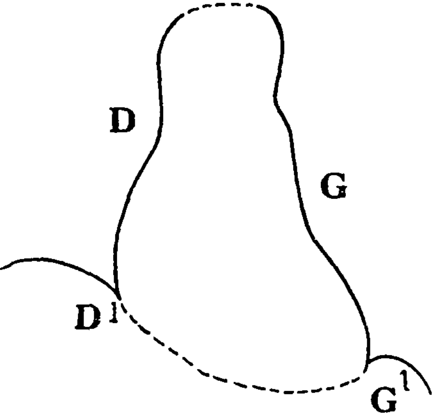
VIIIa



N° Ex : 2265
Inf. N° Mle 2953
Ind. Pignet : 30
2me Ex :

	1er Ex :	2me Ex :
Diam. longitudinal	16	13
——— horizontal	14·5	12·7
——— ventriculaire G	10·5	9
——— ventriculaire D	14·5	12·5
Ind. ventriculaire	1·4	1·38

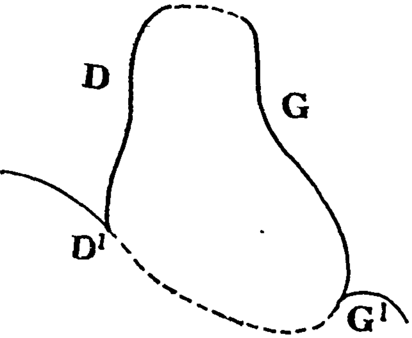
IX



N° Ex : 2246
Inf. N° Mle 1905
Ind. Pignet : 30

Diam. longitudinal	13·5
——— horizontal	11·1
——— ventriculaire G ..	7·7
——— ventriculaire D ..	11·7
Ind. ventriculaire	1·5

X

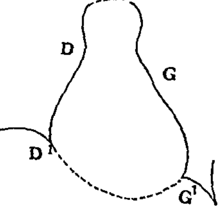


N° Ex : 2247
Inf. N° Mle 1901
Ind. Pignet : 30

(Malade couché)

Diam. longitudinal	12
——— horizontal	11
——— ventriculaire G ..	7
——— ventriculaire D ..	10·7
Ind. ventriculaire	1·5

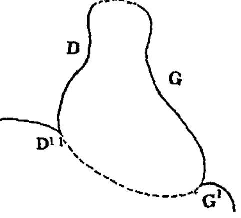
V



N° Ex · 2202
Inf N° Mle 3612
Ind. Pignet : 28

Diam. longitudinal	..	14
———horizontal	.	12·7
———ventriculaire G	..	9·5
———ventriculaire D	..	12·4
Ind. ventriculaire	.	1·3

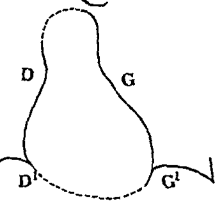
VI



N° Ex : 2179
Inf. N° Mle 4068
Ind Pignet : 27

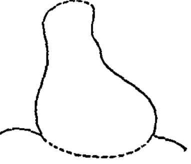
Diam. longitudinal	..	15
———horizontal	..	14·5
———ventriculaire G	..	9
———ventriculaire D	..	13
Ind. ventriculaire	..	1·4

VII



N° Ex : 2014
Inf. N° Mle 1912
Ind. Pignet : 30
1er Ex :

VIIa



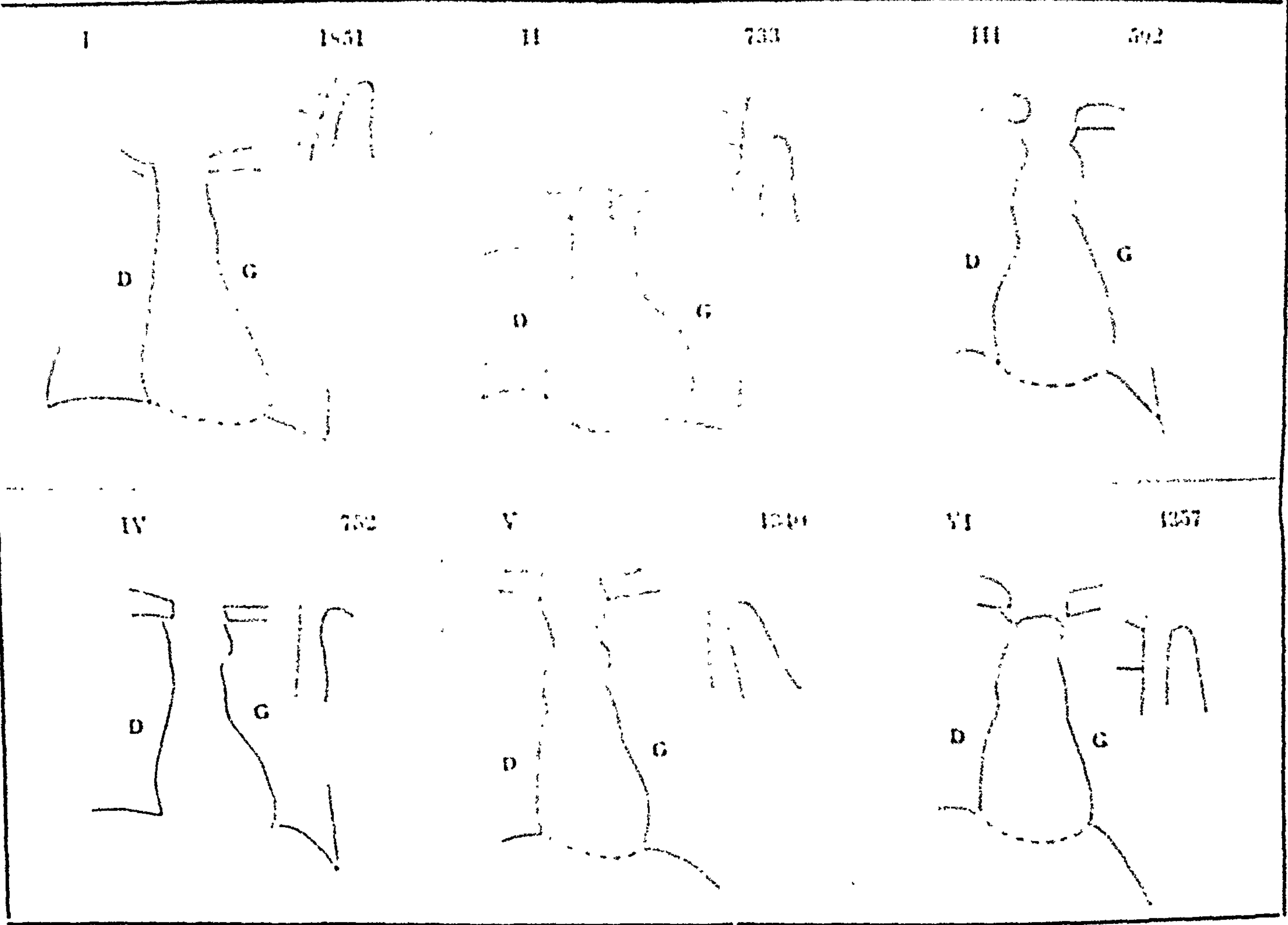
N° Ex : 2245
Le même que ci dessus 2me Ex :
Inf. N° Mle 1912
Ind. Pignet : 30

Chiffres des 2 examens.

		1er Ex :	2me Ex :
Diam. longitudinal	..	13	11·3
———horizontal	..	12	11·2
———ventriculaire G	..	9 5	7
———ventriculaire D	..	11	10 5
Ind. ventriculaire	..	1·7	1 5
——normal	..	1·2 à 1·4	

SERIE B.

(6 *infirmiers.*)



	I	II	III	IV	V	VI
Indice de Pignet	23	15	31	32	29	28
Diam. long.	13	12	12	11	12	12
„ horizonl.	10·1	11·3	10	9·5	9·7	9·5
„ ventricul. gauche	7·5	8	7·5	9	8	8
„ „ droit	9	11	8·6	9·5	8	9
Indice ventriculaire	12	1·3	1·1	1·05	1	1·1
	Normal	Légère hypert. des 2 ventr. et ectasie de l'aorte.	Cœur en goutte.	Légère hypert. ventr. gauche.	Cœur en goutte.	Cœur en goutte.

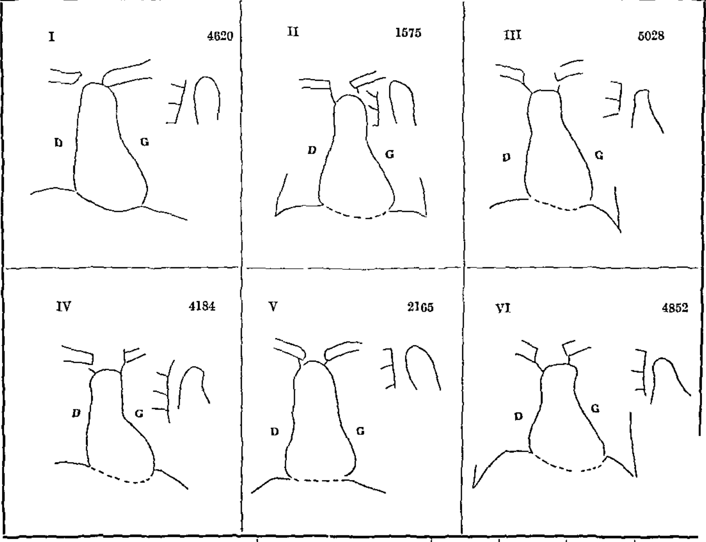
SERIE A.

(*Malades chirurgicaux*)

10 annamites de 20 a 30 ans

Pignet de 20 à 34, Moyenne 26 4

Voir Suite I, II, III, IV, V, VI×2



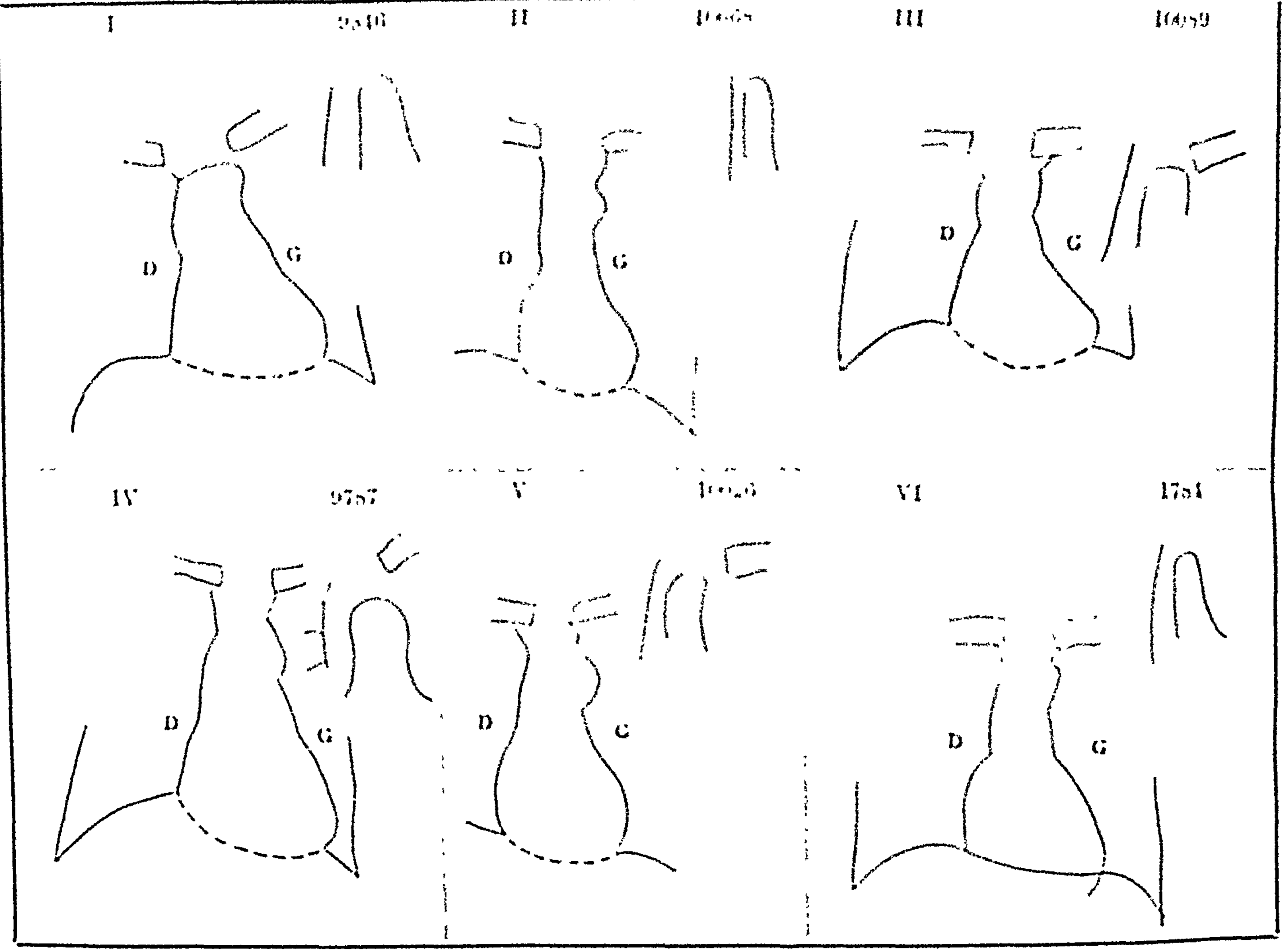
	I	II	III	IV	V	VI
Indice de Pignet	20	31	34	34	27	21
Diam. long.	13 5	12	12 5	12	11	12
„ *horizonl*	11	11	10	10	10·5	11
„ ventricul. gauche	8 5	8	8	7 5	7	6 5
„ „ droit	10	10 5	8 5	9 5	9 5	10·5
Indice ventriculaire	1 18	1 3	1 66	1 2	1 3	1 5

SERIE C.

(*6 anémiés prisonniers.*)

Pignet de 21 à 42.

3 hommes.—Pignet de 21 à 32. 3 hommes, ventr. droits dilat.—Pignet de 33 à 42.



	I	II	III	IV	V	VI
Indice de Pignet	42	32	38	33	21	28
Diam. long.	13·5	11·7	12	14·5	13	13
„ horizonl.	12·5	10	11·5	13	11	11·8
„ ventricul. gauche	7	7	6·5	8	8	8·9
„ „ droit.	12	9	11·2	13	9·6	10·8
Indice ventriculaire	1·7	1·2	1·7	1·6	1·2	1 2
	Ventr. droit dilat.	Normal	Ventr. droit dilat.	Ventr. droit dilat.	Normal	Normal

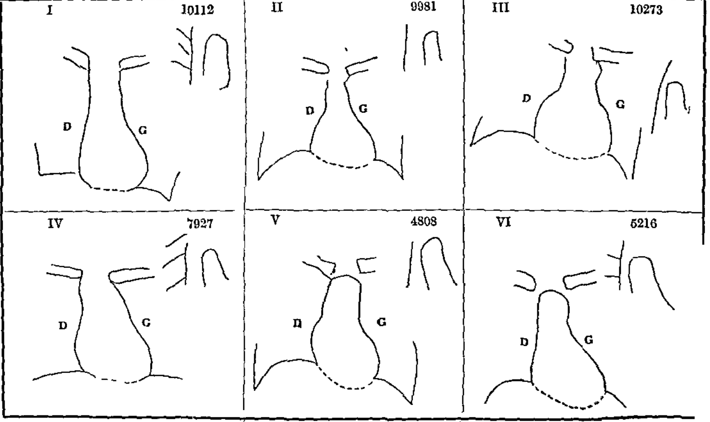
SERIE C.

(*prisonniers*) I et III.

SERIE A.

(*Malades chirurgicaux*)

(Suite I, IV, V, VI.)



	I	II	III	IV	V	VI
Ans.	17	16	17		[illegible]	[illegible]
Indice de Pignet ..	27	49	46	24	[illegible]	[illegible]
Diam. long. .	11 5	10	11	[illegible]	[illegible]	[illegible]
„ horizonl.	9 7	10	11·7	[illegible]	[illegible]	[illegible]
„ ventricul. gauche	7	6	[illegible]	[illegible]	[illegible]	[illegible]
„ „ droit	8 6	9 3	[illegible]	[illegible]	[illegible]	[illegible]
Indice ventriculaire	1 2	1 5	[illegible]	[illegible]	[illegible]	[illegible]
	Normal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

DISCUSSION.

Dr. S. G. Galstaun (Bengal): French radiologists are to be congratulated on the advances they have made in the study of cardiology by radiological methods. The process of orthodiagraphy necessarily involves prolonged screen examination and is apt to be tedious. For this reason it has been replaced in America particularly by radiography at a distance of six feet or more, so as to obviate the distortion which put the method out of court at the ordinary distances used in radiography. With modern apparatus, however, flash exposures giving excellent radiograms may be made at 6 feet and more, using currents of the order of 100 milliamperes at a tension of 90 to 100 kilovolts. It is a matter of regret that much of the excellent work of French radiologists in working out the character of the heart in various conditions has not been translated into English.

Dr. P. C. Chakravarti (Bengal): Orthodiagraphy is a radioscopic procedure involving prolonged exposure to X-rays, both for the operator and the patient. If suitable protective methods could be devised, orthodiagraphy might prove of great value in pelvic measurement for the diagnosis of pelvic contractions. Dr. Jendran is requested to describe some protective methods.

Lieut.-Col. J. Shaton, I.M.S. (Retd.) (Bengal): Emphasised the mental picture one forms of the normal and abnormal heart in the course of screen examinations.

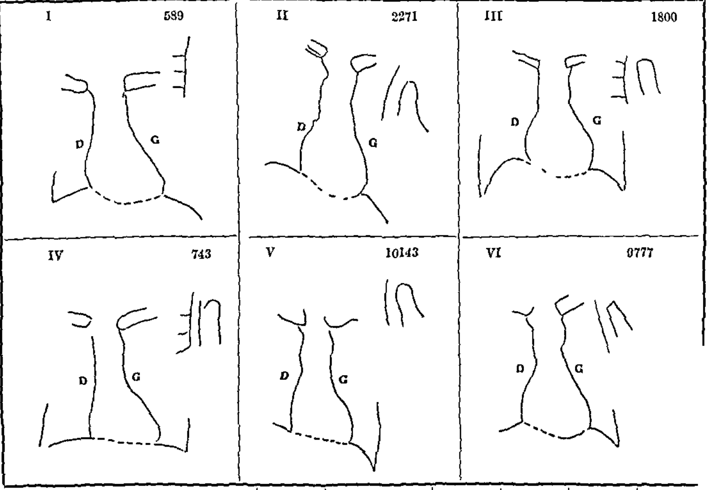
SERIE B

(4 *annamites normaux 'infirmiers' de 20 à 30 ans*)

Pignet de 18 à 27 Ind ventr de 1 à 1 2

SERIF C

(2 *annamites normaux prisonniers*)



	I	II	III	IV	V	VI
Indice de Pignet	27	27	18	-3	31	-4
Diam long	13 5	12 5	11	12	12	11 5
" horizonl	12	10 3	10	10 6	10	1[illegible]
" ventricul gauche	8	8 6	7 8	7 5	8	
" " droit	10	9 5	9	10	8	10
Indice ventriculaire	1 2	1 1	1 15	1 2	1	1

DISEASES OF THE ALIMENTARY TRACT.

Chronic indigestion.
Gastritis and colitis.
Gastric ulcer.
Inflammation spreading to the bile ducts and gall-bladder.

These conditions are due to the constant swallowing of septic materials and the result of the chronic irritation set up.

DISEASES DUE TO THE ABSORPTION OF SEPTIC PRODUCTS FROM THE MOUTH.

Chronic Rheumatism. In many cases this disease has been traced to the presence of toxins absorbed from bacteria in the mouth.

Rheumatoid Arthritis. Although it is extremely doubtful if this condition is due to the absorption of toxins from the mouth, I had a case about 6 months ago in which the patient, a male, aged about 56, received definite relief from arthritic pains in the shoulder joint by the extraction of a crowned incisor root which showed a definite apical abscess in a skiagram.

Chronic Sciatica. Here again I quote this condition as the result of personal experience. In 1923, a patient, male, aged about 40, was sent to me by Lieut.-Col. Acton, I.M.S., of the School of Tropical Medicine, Calcutta, for oral examination. He was suffering from a very acute form of sciatica and his medical history showed that while on military service in 1914 to 1918 he had had to be allowed 3 months' sick leave on account of sciatica. His condition improved but there was recurrence in 1923 which was more acute than the first attack. Col. Acton had examined him thoroughly and decided that organically he was quite sound and thought that the source of infection might be in the mouth. When the patient came to me he was so crippled that when washing out his mouth he was unable to use the fountain spittoon at the side of my chair and had to be given a hand spittoon in which to expectorate. On examination the mouth proved to be healthy and the teeth in good condition, except for a gold crown on the 2nd upper right premolar tooth. It was slightly loose and the gum round it was inflamed. A skiagram was taken by Major Shorten, I.M.S., and showed a considerable amount of apical absorption. We decided to extract the tooth and this was done quite easily under a local anæsthetic. Col. Acton sent along a sterile test tube into which I placed the root and he had a culture made from the bacteria found round the apex and from which he gave the patient several injections. Six weeks later I received a letter from the patient saying that he was entirely cured. I do not think that any further comment on this case is necessary.

Retrobulbar Neuritis.—About 12 months ago, a patient was sent to me by Major Shorten, I.M.S., who asked me to treat the case as urgent as she had lost the sight of her left eye. She had consulted Col. Coppinger, I.M.S., about it and,

DENTISTRY.

ORAL SEPSIS

BY

H A TAYLOR L D S, R C S (Edin)
Calcutta

ORAL SEPSIS has become such a prominent factor in disease that it might be well to consider some of its aspects and its effects on the system generally It is commonly agreed that it is one of the main causes of much chronic disease leading eventually to permanent disablement and often premature death MONDAY, DEC 5TH, 11 A M TO 1 P M

The term is a wide one covering, as it does, all septic conditions to be found in the mouth, but those which are most commonly considered to be the most common cause of trouble are *pyorrhœa alveolaris* which, to my mind, is a bad term and is better described as a chronic rarifying periodontitis the so called *apical abscess* or granuloma *necrosed and carious teeth* buried roots and impacted teeth particularly 3rd lower molars popularly called wisdom teeth Of these pyorrhœa and carious teeth may be styled open infections and the others closed infections, and, of the two, I think that the latter are the more dangerous

The diseases, which are commonly associated with oral sepsis, may be classed as follows —

1 Inflammation of mouth and pharynx
2 Diseases of the alimentary tract
3 Diseases due to the absorption of septic products from the mouth, e g, toxins and organisms
4 Diseases which are influenced by the presence of oral sepsis

INFLAMMATION OF MOUTH AND PHARYNX

Under this heading might be placed —

Chronic tonsillitis
Adenitis
Cellulitis
Necrosis of the jaw
Suppuration of the antrum
Cancer of the tongue and lips

Tuberculosis.—Oral sepsis must be considered as a pretubercular state in children where the lymph glands are infected by the absorption of septic matter from the mouth and their powers of resistance to the tubercle bacillus lowered. In adults, where the bacillus has already got a hold, their powers of resistance are very much lessened if the system generally is debilitated by the continued absorption of septic matter from the mouth.

Treatment.

We now come to the question of the means necessary to stop this widespread and dangerous condition. It may be thought that I am a confirmed believer in the practice of wholesale extraction of the teeth as a cure for the condition, and so I am when I have proved to my satisfaction that the teeth are so hopelessly infected that no other course is open to me, but I do deplore the hankering of the medical profession generally after this treatment as a cure for all bodily ills—a state of affairs which I am sorry to say became very general in 1920-21 in Britain. Patients with obscure symptoms went to highly distinguished medical men and were told that their only possible hope of a cure was to have all their teeth extracted. I am only too sorry to say that many members of the dental profession were ready to fall in with the medical opinion and carry out the nefarious work. What was the result ? There are quite a number of people in the world to-day trying to masticate their food with indifferently fitting artificial dentures who would have been much happier and probably much fitter had they hung on to their own natural teeth.

Just a word of warning about 'pyorrhœa'; do not, because there are evidence of pus round a patient's gum, fly to the conclusion that they have got 'pyorrhœa.' I have had many cases sent to me by medical men diagnosed as pyorrhœa in which a careful removal of sub-gingival tartar has resulted in the mouth being made absolutely healthy, and in some cases the stoppage of a prolonged course of bismuth has had the same result. Please leave the final decision, aided by a thorough clinical and radiographical examination, to the dental surgeon.

As regards the apical abscess, or closed infection, we are on entirely different ground and I am beginning to wonder if the devitalization of teeth is really worth while. The radiograph has shown us that the great majority of devitalized teeth ultimately develop apical infection no matter how careful and aseptic our technique. I really cannot see how we are going to guard against this infection in a part of the root to which we have no access unless we perform the purely surgical operation of apicoectomy in each case and would it be worth while: I doubt it.

In my opinion there is only one way of stopping oral sepsis and that is by education and prevention. The public must be educated up to the fact that children should be taken to the dentist at the earliest opportunity for examination and their teeth watched and attended to carefully and regularly through life. They must be taught to use their teeth as Nature meant us to use them. Teeth

as he is very enthusiastic about the teeth as a virulent cause of eye troubles, he sent her to Major Shorten to have skiagrams taken of the teeth. These showed the following conditions: Left upper lateral incisor crowned and showing definite apical infection. Left upper canine also crowned and the anterior abutment of a bridge extending to the 2nd left upper molar. This root and the molar root also showed definite apical infection as did also the root of the 3rd upper molar. The 2nd right upper premolar was also crowned and the root was infected as also was the root of the 2nd left molar tooth which had been devitalised.

None of these teeth was actually troubling the patient, but I decided that they must come out and after a considerable amount of persuasion on the part of her husband and myself she decided to have it done. I removed the bridge then and there, and next morning the patient came in and I extracted the roots under N_2O and E.C. In 48 hours the patient's sight was practically normal. Here again I consider that comment is needless, the result speaks for itself.

Pernicious Anaemia. Well known authorities in medicine, particularly William Hunter, have shown the close relationship between this disease and oral sepsis. He considers the disease to be localised to the alimentary tract and that it is definitely due to an infection of certain parts of the gastric mucosa. The disease is frequently associated with septic conditions of the mouth and many medical men consider that oral sepsis is a definite factor in the disease.

Debility. This is a condition with which we are all familiar. No definite organic lesion can be found but the patient is undoubtedly ill. He is listless and thin; sallow of complexion, generally unhealthy looking and has no appetite, in fact shows all the symptoms of malnutrition. On examination many of these cases have shown definite signs of oral sepsis and the condition has been found to be due to the constant absorption of toxins from bacteria in the mouth and in many cases general extraction of the teeth has proved entirely efficacious.

Ulcerative or Malignant Endocarditis. This is due to a streptococcal infection which attacks the valves of the heart and which generally proves fatal. It has often been found to be due to the absorption of septic toxins from the mouth.

Insanity. Under this heading we have the famous cases cited at the last meeting of the British Medical Association where patients were definitely cured by the extraction of septic roots.

Diseases which are Influenced by the Presence of Oral Sepsis.

Cancer. While this disease can be directly attributed in the case of cancer of the lips and tongue to broken down and badly carious teeth which have sharp and jagged edges causing chronic inflammation and irritation by the constant rubbing of the lips and tongue against them, there is no doubt that many cases of cancer of the alimentary tract are the result of the chronic irritation set up by the continued absorption of septic matter from the mouth.

as a stimulant—aromatic—carminative (कटु Katu)—astringent and an aphrodisiac (कामाग्निसन्दीपन Kamāgni Sandipanam)(1 2 3) It contains an aromatic volatile oil containing a phenol called chavicol, a powerful antiseptic, and an alkaloid 'arakene' So also supari (पूग Puga), i e , areca or betel nut (*Areca catechu*), has been used as a stimulant—astringent—and a vermifuge (क्रिमिनाशक Krminashak) It is also prescribed to increase the flow of saliva, harden the gums and sweeten the breadth(1, 3) It contains tannic and gallic acids oily matter and three alkaloids

If asked to explain how Indians came by this habit of chewing pan supari all day long I would say that these drugs were so efficacious that they were frequently prescribed for the purpose, almost to the exclusion of other drugs This frequency so inspired the faith of people in them that they began to believe that if taken regularly, they may even prevent the diseases that they *were known to cure To understand how people came by this habit, it is* necessary to think of the usual custom amongst Hindus of offering pan supari before and after meals to their guests Its origin lay in the property of the drug as a carminative In his solicitude for the digestion of his guests the ancient host offered them pan supari as a preventive when they arrived, and as a carminative and digestive when they departed after a heavy meal This frequent nay almost incessant attention of the host to the digestive welfare of his guests, so obsessed the minds of the people that this offering of pan supari came to be an institution of common courtesy, and as such it has prevailed in India for centuries, and still prevails among all classes and castes of Hindus and to a great extent also among the Mohammedans As this custom has its origin in the carminative property of the drugs so it has its origin also in its aphrodisiac property Originally pan supari and especially the pan, was prescribed by Hindu doctors to [illegible] the carnal passion in one who naturally lacked it Partly because [illegible] aphrodisiac property and partly because of its deodorant and [illegible] properties pan supari came to form a part of the ritual, an [illegible] ritual with which a wife welcomed her husband to her bed [illegible] I believe still prevails among the Hindus In the chapter on [illegible] the bedchamber, the medical instructions that have even the [illegible] are that the housewife must light the lamp and [illegible] She must put on clean clothes, apply sindura (red oxide [illegible] chew pan mixed with usual spices She must give [illegible] nutmeg saffron, almond and musk and also [illegible] (betel leaf) (2) To my mind the idea of her [illegible] her breath, and the idea of giving it to her [illegible] hilarating and aphrodisiac effect This [illegible] of religious sanction, got such a hold [illegible] routine practice with prostitutes to offer [illegible] not they needed its aphrodisiac [illegible]

were meant for mastication and at present are not being used as they were meant to be used A tooth and its surrounding tissues are like a muscle If not used properly they become soft and flabby and a prey to all sorts of infection, and, as is well known, the mouth is a hot bed of such infection When the child is young educate it up to chew and give it a diet that requires chewing, also teach it the importance of oral hygiene Indians, as a race, suffer largely from 'pyorrhœa' and I am certain that it is largely due to their soft diet

If anything can be done towards educating patients in this way, much will be done towards the wiping out of oral sepsis

of lime concretions on the teeth, atrophy of the alveolar process, and loosening and loss of the teeth.' That pan supari's deleterious effect on the teeth was recognized by the ancient Hindu doctors is clear from the fact that in Ayurveda, i.e., the old Indian medicine, pan(2) and also supari(3) are contra indicated for certain conditions of the mouth and general body. It will be seen, therefore, that there is no sanction in Ayurveda for its use at all times and in all conditions, as is alleged by its devotees and advocates. To me it seems that, like all other good things, pan supari, a good remedial agent for several diseases, including spongy bleeding gums, is very much abused nowadays. In small doses, and if used only when needed, it certainly works as a carminative and digestive, but in the big and frequent doses used nowadays, it clogs the wheel of digestion. So far I have dealt with pan supari. Now I shall pass on to the use of baval stick as a tooth-brush.

Use of Baval stick as a Tooth brush

Baval (बब्बुल Babbul) (*Acacia arabica*), as is well known, is almost universally used by Indians as a tooth-brush. It is an inheritance they have received from very ancient times. Like pan supari, it also has its origin in medical science, for it is prescribed in Ayurveda as a tooth brush. But Ayurveda does not recommend its use as a tooth-brush for all times, conditions and persons. Though it is the most common twig recommended as a tooth brush, yet there are twigs of other trees like Vata, i.e., the banyan tree (*Ficus indica*), Karanja i.e. the Indian beech (*Pongamia glabra*) Neem i.e. the margova tree (*Melia azadiracta*) Pippala, i.e., the peepul tree (*Ficus rligiosa*) etc., are also recommended, and some wonderful properties are ascribed to them. The use of any of these twigs as a tooth brush is prohibited for persons suffering from certain diseases(4). Like pan supari, the baval stick was a fine remedial agent for certain diseases of the mouth, but is now very much abused by the lay public for the great bulk (95 per cent) of them use this particular variety whether they need it or not. The two great points always urged by the Hindus, in favour of the use of these twigs as a tooth-brush are cleanliness, for they can always be discarded after use, and cheapness in spite of such frequent changes. Clean and cheap they indeed are, but as they have these good points so also they have their bad points. The instructions for the use of this twig as a tooth brush are that the user must chew it for about 15 to 20 minutes in order to fray one end, and then to use the frayed end as a tooth brush to clean the teeth. Chewing the twig has its merits and demerits. The merit is that the chewing so scrubs the occlusal surfaces clean that a Hindu's teeth are generally free from caries. This is a great advantage, but against it there are some serious demerits. These are.—

(1) In most of the cases, as a result of chewing, the occlusal surfaces are worn out and, as a result of the exposure of the dentine, become sensitive.

(2) As the result of frequent contact with the highly astringent juice (it contains tannin in goodly quantity), the investing tissues of the teeth contract

of all nationalities for they are now used all the civilized world over What I have to say about these tooth pastes will perhaps draw upon my head the wrath of those interested in the manufacture of these tooth pastes Mindful as I am of these consequences I feel I must take the opportunity of this Congress to bring the tooth paste which to my mind is a bane of the human mouth to the attention of the members of the medical profession and through them to the lay public Is there any justification for the existence of paste as a means of cleaning the teeth? If we realize properly the real meaning of using anything with the tooth brush we will see that it has no justification at all Now what is the real meaning of the use of a tooth powder? It is to add to the scrubbing action of the tooth brush It is also meant to excite the flow of saliva and bring into action its antiseptic property but this property is so insignificant that it can safely be ignored Now if this is the real reason of using a tooth powder then there is no justification for the existence of a tooth paste for instead of adding to the scrubbing action of the brush it by the virtue of its main ingredient lessens that action Tooth pastes generally have vaseline lanoline glycerine oil and soap as a base and these are lubricants and not detergents as powders naturally are Besides this important argument against their use other more serious objections which exist are —

(1) They contain sugary and fermentable substances and such substances should never be brought in contact with the teeth

(2) They stick to the surfaces of the teeth and in the spaces between them After long use the teeth look slimy as if they had not been cleaned with a tooth brush for some time

(3) Not only do they stick by themselves but they also help the fermentable food stuffs to stick on the top of them

(4) By their constant contact at the neck of the teeth they have a softening effect on *the enamel and the gums Under their long use the gums get spongy and* swollen and ultimately they exude blood and pus

These are very strong condemning conclusions which I have come to after long observation The method I adopted was the routine practice of taking patients off these pastes and keeping them on powders and watching the beneficial effects of this change on the condition of their mouths I am convinced that these tooth pastes are distinctly harmful to human mouths 'What then is responsible for such widespread use of these pastes? To my mind two things are responsible —

(1) The credulity of the lay public and unfortunately also of the medical and dental professions in the glittering but lying advertisements of these pastes

(2) The last world war As the tubes in which these pastes are put up are easier to carry about in the haversack they were recommended in preference to bottles of tooth powders

I have been convinced that pastes are the bane of human mouths and that conviction did not need any outside support but when it came, unsolicited and

and recede away. First the gum is affected, and its recession exposes the underlying bone to the action of the juice. In turn the bone also gets destroyed, thus giving rise to pyorrhœa and gradual loosening of the teeth. In short the condition becomes what I described under the heading of pan-supari but to a lesser extent. As a Hindu generally uses both pan-supari and the baval-stick, and as his mouth is generally affected by pyorrhœa alveolaris, the question that naturally arises is: 'Is pan-supari or the baval-stick responsible for the pyorrhœa?' I have come to the conclusion that both the pan-supari and the baval-stick are responsible for it; but pan-supari is more so than the baval-stick. The method used in my observations has consisted of the following:—

(1) To people amenable to harmless experiments for a few days, I advised complete (if possible) or partial abstinence from pan-supari while they went on using the baval-stick, with the result that the pyorrhœa was considerably ameliorated.

(2) At another time I got them to continue their pan-supari and give up the baval-stick, with the result that the pyorrhœa continued almost as it was.

(3) Then I cleaned the teeth, treated the gums for pus, and took them off pan-supari and baval-stick and put them on a hard tooth-brush and plain powder, with the result that the pyorrhœa disappeared.

(4) Then again I put them on pan-supari and the baval-stick alternately, with the result that the mouth condition tended to get worse again, more so by pan-supari than by the baval-stick.

Thus the conclusions I have reached after these observations are that pan-supari and the baval-stick in such quantities and frequency as used to-day are distinctly harmful to the gums and general mucosa of the mouth, though they keep the teeth practically free from caries.

This habit of using pan-supari and the baval-stick, backed up by the history of long usage and sanction for their use in Ayurveda, is so ingrained in the Hindus that it is practically futile to ask them to give them up in favour of a brush and plain powder. 'What is the remedy?' To minimize their evil effects I advise those, who will not give up pan-supari, to control its use as much as is possible, and then clean the teeth and gums by means of a tooth-brush, plain chalk powder and plenty of water every time they take the pan-supari, and particularly at night just before going to bed. I advise those who do not want to give up the baval-stick to fray the stick outside the mouth in order to take away its astringent juice, and then use the frayed end as a tooth-brush. Allowing their use in this way, one can certainly minimize their evil effects.

Tooth-pastes.

Pan-supari and the baval-stick, as I have shown, have their vices and their virtues, but tooth-pastes to my mind have no virtue at all. Of all these three, tooth-pastes are the most harmful to the human mouth. While pan-supari and the baval-sticks are harmful to Indians only, these pastes are harmful to people

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THE HABIT OF PAN CHEWING IN ITS RELATION TO THE PREVALENCE OF PYORRHŒA ALVEOLARIS IN INDIA

BY

R AHMED, D D S,

Calcutta

THE ætiology of pyorrhœa may be divided into two main headings (*a*) local, and (*b*) systemic

It is not the purpose of this paper to discuss in detail all the causes that lead to pyorrhœa alveolaris We shall, in this paper try to show the role the habit o pan chewing plays in causing both local and systemic effects leading on to pyorrhœa in those addicted to it

The teeth and jaws of the people of India are, from the point of view of structure, form and arrangement, comparatively more perfect than the teeth and jaws of the modern Europeans and Americans All observers are agreed on the point that dental caries is the scourge of the Occident, while pyorrhœa alveolaris is the scourge of the Orient There are various opinions as to why this is so Some say that the peridental membrane of the people of India is inherently deficient Some opine that, as the people are vegetarians, their teeth lack the exercise needed for the proper development of the peridental membrane and hence are susceptible to pyorrhœa All these views are open to question and it is not the purpose of this paper to discuss them But there is no doubt that the habit of pan chewing does influence the formation of calculus around the gum margin and on the roots of the teeth These facts are clinically verifiable Although complete statistics are not available just now, all observers are agreed that pyorrhœa alveolaris is almost universal amongst the Indian people above thirty five years of age The writer examined recently, off hand, in sequence and without making any choice, one hundred patients and kept records It was found that seventy eight out of the hundred had pyorrhœa in some stage or other So it can be readily seen how prevalent this disease is amongst all Indians

Pyorrhœa alveolaris is a disease of the peridental membrane In this connection it is advisable to remember that the alveolar process is nothing more than the thinned out edges of the maxillary bone and their bony offshoots The socket is an enlarged medullary space and is made up of the above described bony offshoots which constitute the alveolar process Bundles of ligament fibres run from the wall, of the bony offshoots of the alveolar process and maxillary bone and are embedded

unasked for, in the form of an article called 'Dam(n) the mouth-washes and pastes' in the *Oral Topics* of April 1920 by Dr. Zarbough from Italy, I certainly welcomed it. Of the tooth-pastes, he says: 'Tooth-pastes are a snare and a delusion. While they have not the same fault that washes have, as the patients will use the brush with the paste, still the most harmful thing about the pastes is the fact that they contain enormous quantities of glycerine, soap, oil to keep them soft and saleable. Glycerine and soap should never be used in the mouth, because of their softening effect on the gums. They become soft and spongy, and then bleed.' Such is the observation of another careful and observant dental surgeon several thousand miles away.

In concluding I should like to say that pan-supari and the baval-stick have a history of long usage behind them and have so rooted themselves in the hearts of Indians, that to try to uproot them from their secure position will be inviting the wrath of the Indian public and especially the practitioners of Ayurveda. What is true in case of pan-supari and the baval-stick in relation to the Indian public, is also true in case of tooth-pastes in relation to the civilized world. So harmful are they, that I have felt that an attempt, however futile it may prove, must be made to uproot them from their secure position, and what place could I find better than this Congress for such an attempt.

REFERENCES.

(1) Nadkarni, K. M. .. Indian Materia Medica.
(2) Thakore Sahib of Gondal .. History of Aryan Medical Science.
(3) शालिग्राम निघण्टु भूषण (Shaligrama Nighantu Bhushana).
(4) Sen Gupta, K. N. .. .. The Ayurvedic System of Medicine, Vol. I, p. 3.

they can live for days without any other food except pan The lime in the pan is swallowed with the remnants of the leaf and in a few months we have great excess of lime in the system which comes up in solution in the saliva and is deposited on the teeth as calculus in large quantities The blood stream gets charged with excess of lime and this is brought to the teeth in the serum as serumal tartar There is no doubt that this surcharging of the system with lime changes the condition of the saliva Analysis of salivary calculus shows it to be composed of about 22 per cent of water and organic matter and about 78 per cent of inorganic matter Dr Black has established that overeating creates an excess of globulin or globulins in the blood which, when over accumulated, are thrown out with the secretion or as an excretion, probably in combination with calcium salts as spherules of calcoglobulin which deposit in the mouth first as a soft mass and then harden by decomposition of colloid elements He is of the opinion that serumal deposits have a similar origin It seems reasonable, therefore, to conclude that the habitual pan chewer, due to his taking excessive amounts of lime into the system gets his blood stream charged with excess of lime and this is deposited on the teeth as serumal tartar

The constant irritation from the pan, the pan fibres which lodge in between the teeth, and the serumal calculus, which is deposited on the roots of the teeth, all lead to the destruction of the peridental membrane interposed between the root of the tooth and its socket In course of time pus is formed and this pus slowly dissolves the bony wall of the socket At last a time comes when the tooth loses all its support and is thrown out by nature as a foreign body The point that concerns us is the fact that pan chewing acts as a factor of great importance, causing the irritation of the peridental membrane and finally leading to its destruction The fact that pyorrhœa is more prevalent in India than in other parts of the world is due to this particular habit of the people It can safely be said that fully 90 per cent of the people of India chew pan Some take a hundred or two a day, while others take ten or fifteen a day It is an almost universal custom

Those who have observed closely must have been struck at the devastation that pan makes on the soft tissues of the mouth The teeth are discoloured an ugly red, the necks of the teeth are completely covered with salivary tartar. The gums are pushed down The peridental membrane and the alveolar process are destroyed The teeth sit in a bed of pus, part of which is swallowed and part absorbed by the lymphatics It is the consensus of opinion of all the dentists practising in India that pan chewing is one of the most fruitful sources of pyorrhœa alveolaris Nearly 70 to 80 per cent of the adult population of India suffer from pyorrhœa. A great improvement could be made in the [illegible] of every dentist and medical practitioner in the land enlisted in the campaign [illegible] Some will say this is a superhuman task and [illegible] important and reforms which are worth while are [illegible] why we as a profession should not raise our [illegible]

deeply into the cementum of the root, forming a circular ligament which keeps the tooth suspended in the alveolar cavity. Between these bundles of ligaments there are spaces filled with loose cellular tissue (medullary spaces) which communicate with other similar medullary spaces of the maxilla and alveolar process. The disease begins with an inflammatory process of the gum-margin at the gingival space, it destroys the epithelial tissue and gradually involves the bones, which later become necrotic. New bone formation takes place and results in partial encapsulation. It is the involvement of the bony socket which is considered by almost all observers to be the characteristic feature of this disease. When left unattended, the osteitis of the bony socket leads to pus formation, and, in course of time, the socket is gradually destroyed and excreted as pus, the teeth eventually being extruded as a foreign body.

As has been said before, the causes of pyorrhœa are many. As far as India is concerned, one of the reasons why it is so prevalent here is because of the prevalent custom of pan-chewing. Almost all educated Indians, who are addicted to this habit, are emphatically of the opinion that, as pan consists of an astringent leaf, some carminatives, deodorants and an alkali, it is positively beneficial to the digestion and its regular use conduces to good health. That such a view is absolutely unfounded may be proved from the fact that the habitual pan-chewer is a dyspeptic at the age of thirty at the most, he invariably suffers from pyorrhœa alveolaris and its attendant sequelæ. I have handled thousands of cases where I have seen and been convinced of the baneful effects of this prevalent habit and I feel it a duty to sound a note of warning to my countrymen as well as to all medical men practising in India. The only good points in favour of pan are that it is a good antacid and deodorant, and its use makes the use of the lip-stick superfluous for Indian ladies. But its merits are outnumbered by its demerits. Pan consists of an astringent leaf on which is placed a smear of catechu, a pinch of slaked lime and lastly a few bits of betel-nut and spices. The whole is enclosed within the leaf, placed in the mouth and chewed, generally after meals. This becomes a habit like smoking and grows until some people consume a hundred or two a day. The result is that the pan-chewer is constantly stimulating his salivary glands to action when there is nothing in the mouth to act upon. This involves an enormous waste of saliva, which is expectorated instead of being utilized to fulfil its natural function as a solvent of starch. The fibres of the leaf and betel-nut get packed in between the teeth and each time still more is packed, until gradually the festoons of the gum between the teeth are forced lower and lower. This leads to the formation of pockets in between the teeth where the remnants of the betel-nut and pan lodge and stay hours and days at a time. This constant irritation of the gum leads on to an inflammation of the gum-margin, which, in course of time, leads on to the formation of pus and destruction of the alveolar process. Some people who use pan also use a preparation called 'Zarda,' which is an aromatic preparation of tobacco. This tobacco preparation is highly irritating to the soft tissues of the mouth. Some who use pan and Zarda constantly, do not feel much taste in their food and

SECTION II

STATE MEDICINE GENERAL AND SPECIAL HYGIENE

INTERNATIONAL ASPECTS OF DISEASE WITH SPECIAL REFERENCE TO QUARANTINE

BY

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Public Health Commissioner with the Government of India

THE subject with which I shall introduce this discussion and on which I wish to speak for a short time is one which has many ramifications It will be impossible in the time at my disposal to pursue many of these which can only be mentioned in passing as different phases of the larger question at issue namely a consideration of the factors which have led up to the present co ordination of epidemiological activities and its effect in simplifying quarantine procedure Wednes Dec 7th 10 A M t 1 P M

It is both interesting and profitable in connection with a nation such as Great Britain whose Empire responsibilities are both great and widespread to hark back to early developments in the realm of protection from disease About the period of Queen Elizabeth s reign Great Britain first began seriously to colonize Newfoundland our oldest Colony being occupied in 1583 With the establishment a few years afterwards of further Colonies in what are now called the Southern States of America more especially in Virginia the real foundations of our Colonial Empire may be said to have begun to be laid At this period public health conditions in Great Britain were not only in a very backward state but a public health conscience as we know it to day was non existent It is therefore not a matter of surprise that in our new overseas Colonies little in the nature of public health work was attempted and less was done largely no doubt through ignorance of what was necessary Even when a public health conscience did develop in Great Britain and public health procedure began to be systematized, nay even up to within the last 50 years most of the lessons which were being learned in Great Britain were left unapplied in most of our Colonies

Our naval and mercantile marine operations introduced us early to the dangers of scurvy and the need for pure water and fresh provisions Our early involvement in the slave trade traffic at once brought home to the early pioneers,

definitely know to be deleterious to the human system. Be the custom, ever so ingrained, still we shall and ought to try to reform or partly remedy this habit amongst our people. I have consistently waged a war against pan-chewing and I can say that it has borne some fruit. Some families have entirely given it up; others have greatly diminished its consumption. If every dental and medical practitioner were to preach against the use of pan and show their patients how very harmful and objectionable the practice is, there would be less pyorrhœa in the land.

This reform in the habit of the people is very necessary in order to raise the vitality and resistance to disease of the people of India. Cases of cancer of the tongue or cheeks are quite common from the over-use of pan. Dyspepsia and diarrhœa are the common sequelæ. The various other systemic diseases all lead from or are helped by the pyorrhœa which is the direct result of pan-chewing.

The dental and medical practitioners of India would be rendering an inestimable boon to the people if they could even modify to a certain extent this extremely prevalent bad habit which is certainly lowering the vitality of the people. It is also a very unæsthetic habit and stains the teeth and the mouth a dirty red and makes an unfavourable impression on others. Taking a long view of the matter, it would not be far-fetched to say that the high mortality rate of India may be traceable to the extreme prevalence of pyorrhœa, which is undoubtedly due to the custom of pan-chewing. It is up to the dental and medical professions in India to help in the eradication, or even modification, of this vicious custom which is ruining the health of the people of the land.

large volume of practical information which, though often slow to be made use of, eventually enabled adequate rational measures to be framed and undertaken

Meanwhile a long series of very acute and often brilliant medical observers both on land and at sea, the work of many of whom has been so graphically en shrined for us by Dr Andrew Balfour in his recent article in the *Journal of the Royal Society of Tropical Medicine and Hygiene*, were able to lay the foundations of that library of literature on tropical diseases in our possessions throughout the world which paved the way for the great advances of the last three decades

It is not my intention even were I able adequately to do so to trace the evolution of this literature to its present day position familiar as this no doubt is to most of you Most of you from your general reading are cognizant of the stages through which this evolution has passed and appreciate the rapidity with which in our own time—more especially the last thirty years,—the accumulation of precise knowledge in tropical diseases has been speeded up One of the land marks in this connection was undoubtedly the discovery of the malarial parasite by Laveran and the mode of its transmission by Ross both of which gave an impetus to that brilliant series of researches which has given us the precise information in regard to the major infectious diseases which we have to day This has not been without its effect in regard to quarantine procedure, as it paved the way for the elimination of empirical and the substitution of rational procedure in quarantine measures The days of the burning of sulphur in a magic circle within which the mail bags rested on a tripod, though this may have been seen or remembered by some of us, would seem to have disappeared for ever in all civilized countries

By the middle of the nineteenth century most maritime countries in Europe had formulated extensive and in many cases irksome, regulations regarding quarantine procedure *Many—in fact most—of these were different, and, in any* case they bore very unequally on shipping A desire to co ordinate such measures was natural, and had already begun to find expression in the series of shipping Conventions which were made from 1851 onwards These were represented by those of Paris in 1851 and 1859, Constantinople 1866, Vienna 1874 Washington 1881, Rome 1885, Venice 1892, Dresden 1893, Paris 1894, Venice 1897 Paris 1903, 1911 12, and 1926 Each represented an advance on its predecessor culminating in the thirteenth in the series in Paris last summer, this being the ninth Sanitary Convention to be signed

As these necessary and constant revisions suggested the need for setting up some more permanent body in the nature of an International Bureau, in accordance with the Rome Agreement of 1907 such a Bureau was set up in Paris under the name of the Office International d'Hygiene Publique This Statutory Body which, as all of you know, has existed in a corporate form since 1907, consists of a Committee of experts representing 43 different States It meets twice yearly in its own quarters in Paris in order to hear and discuss in French all international

specially in the Southern States of America and the West Indies, the necessity for studying the problem of prevention of disease as presented in the imported African population; whilst the opening up of new tropical territories brought them at once up against malaria of a deadly type, against yellow fever, cholera and malignant small-pox. Slaves were undoubtedly the medium for introducing, wherever they were carried, mass infections of such diseases as ankylostomiasis, leprosy, malaria and dysentery, and many consider it proved that yellow fever reached the West Indies from West Africa by this traffic.

As our Colonies and overseas possessions multiplied and as the occupation of India became effective, our Indian and Colonial administrators were brought into contact with epidemics of the major infectious diseases on a scale unknown in Europe in modern times and unparalleled throughout the world except in China. A further complication was added by the constant Asiatic flow—largely for labour purposes—of Indian, Chinese and Japanese emigrants and immigrants.

To return to Europe, even while the Venetian Empire was in its hey-day, it had been found essential to protect the Venetian community by the establishment of prohibitory rules and regulations against arrivals by sea from infected countries, and to such measures as were then adopted we owe some of our first experiences and ideas regarding organized quarantine.

In due course England was compelled to follow a similar procedure and to codify quarantine rules. As far back as 1825, a considerable and noteworthy revision of the existing quarantine statutes was introduced. This had its repercussion throughout our Colonial and overseas possessions. I shall illustrate this. In 1832, by a special despatch of the Secretary of State for the Colonies, the Australasian Colonies were advised in regard to lines of procedure based on the revision referred to. This despatch, which is of great historic interest, after referring to a ten days' quarantine imposed at Liverpool on all vessels arriving there from infected places in the United Kingdom, suggested the establishment in the Colonies of similar local legislation to enable quarantine to be imposed on all vessels arriving without clean Bills of Health, due regard being had to the time the vessel had been at sea. The distinguished Director-General of the Commonwealth Health Department—Dr. Cumpston—has recently pointed out in regard to this particular despatch that, though it was the first official paper dealing with this subject in Australia,, yet, before its arrival in Australia, the first Quarantine Act of Australia had been passed by the Executive Council of New South Wales on 28th July, 1832. I mention this concrete case to illustrate a condition of affairs which was not confined to one or two of our Colonies, but was largely applicable to all, and for which remedial measures had to be instituted in much the same way for each Colony in accordance with its particular state of advancement.

Our navy and mercantile marine, with their unique experience in the provisioning of ships, the prevention of scurvy and the control of yellow fever on ships in infected ports, was instrumental in bringing to the homeland a

entrusted to this Provisional Health Committee who appointed Dr Norman White, a former Indian Medical Service officer, to direct it

I need not refer in detail to the subsequent role played by it, but it justified its existence and for long remained an integral part of the Health Organization of the League Incidentally it helped to develop the Epidemiological and Statistical Sections of the Bureau at Geneva and at a later date, through the report of one of its members to establish the Far Eastern Epidemiological Bureau at Singapore

The relationship of the Statutory International Bureau in Paris and the Government delegates on its Committee to that of the Health Organization of the League was adjusted by arranging that the former should act as a superior Advisory Council to the latter This arrangement was specially welcomed in view of the fact that many experts are members of both Committees This has now regularized the position, and, incidentally, has upheld the *metier* of the Paris Bureau in its right to frame and deal with international codes as it had been accustomed to before the war

A word now in regard to the respective workings of both these organizations — and in this connection I shall first deal with that of the League in so far as it concerns the subject under discussion Briefly, this aspect of its work may be divided into the four categories of —

(1) Medical intelligence work,
(2) Co ordination of effort in combating epidemic disease
(3) Co ordination of scientific research work and
(4) Collaboration with other League Organizations

(1 & 2) The *medical intelligence work* has developed in four main directions the idea underlying these being that the League Health Organization would become a clearing house for epidemiological intelligence and public health questions of international concern These four directions are represented by —

(*a*) Epidemiological intelligence
(*b*) Collection of vital statistics,
(*c*) Collaboration of vital statisticians and
(*d*) Interchanges of public health personnel

Let us look at them individually

(*a*) *Epidemiological intelligence* – Through the munificence of the Rockefeller Foundation which contributed a sum for five years towards this section, it has been possible not only to organize the Geneva and Singapore Intelligence Bureaux on international lines for the collection of statistical data of infectious diseases but also to publish these results weekly, monthly and annually for the benefit of the world In addition, various problems connected with public health statistics in different countries have been tackled with a view to instituting standards of registration and of comparison in regard to figures, epidemics and their periodicity, whilst all the modern methods of organizing a rapid interchange of this information,

communications regarding diseases and their prevention and to co-ordinate measures arising in connection therewith.

Apart from publishing in French a monthly Bulletin dealing with international medical health matters, one of its main functions is to formulate and revise International Conventions which will regulate traffic from a public health point of view by sea, by land and by air. In this respect International Sanitary Conventions connected with shipping have been of the utmost importance. The older Conventions culminating in the Paris Convention of 1903, besides dealing with the general principles of quarantine, had consolidated in one document certain other international agreements relating, for example, to special quarantine measures in the East and in the Suez Canal. The Committee of the International Paris Bureau undertook the revision of this 1903 Convention which eventually appeared as the 1912 Paris International Sanitary Convention. This in turn was revised in 1926 in Paris and is now awaiting the ratification of the various powers. Under this Convention, the sea-borne traffic of the world is now regulated from the public health point of view.

Those of us who had the opportunity of being delegated to the 1926 Convention, will not readily forget the effect produced by 162 delegates from 69 different nations assembled for this specific revision. Most of us realized the enormous importance of an international code revised by the representatives of 69 nations, who, over the course of two months, discussed in plenary session and subcommittee the details of the 172 articles in all their modern bearings. This was largely possible through the good offices of the Paris Bureau and the courtesy of the French Government, and the document produced as the 1926 Convention represents the latest phase of international quarantine regulations and procedure. I shall discuss it in some detail later on in this paper.

Before doing so, however, I must advert to the entry into the arena of another organization some of whose functions were destined to overlap those of the Paris Bureau. I refer to the organization of the League of Nations, and more especially to that section of it dealing with health. The Health Section of the League of Nations was created in April 1923 to comply with the last clause of Art. 23 (*f*) of the Covenant of the League which stated that 'it was essential to take steps in matters of international concern for the prevention and control of disease.'

It represents the special application in the field of health of a systematic attempt to organize international relations. This was all the more necessary owing to *post bellum* deflections from the pre-existing standards. The preliminary arrangements during the first three years eventually led to the formation, in June 1921, of a Provisional Health Committee. Its birth coincided with the occurrence of those colossal epidemics of typhus and relapsing fever in Eastern and Southern Europe both of which were legacies of the great war and due mainly to its enormous movements of soldiers, refugees, prisoners of war and whole civil population under economic conditions of the worst description. The menace to Western Europe was so grave that the formation and organization of an Epidemics Commission was

(4) We have already seen how *co ordination of effort* in combating epidemic disease commenced with the work of the Epidemics Commission It was continued into the Eastern Mediterranean Enquiry, the Tropical African Diseases Inquiry, the Enquiry into the Far Eastern Ports the Cancer Commission the Sleeping sickness Commission the Malaria Commission and several others Into the details of these I do not propose to enter, but this reference to them will be sufficient to bring home the fact that the activities of the Health Section are like the tentacles of the octopus capable of touching almost every point of importance connected with our subject

Considering the evolution of this organization during the seven years of its existence, the work which it has accomplished and the work which it is now under taking I think I am safe in saying that no similar organization at present in existence could have attempted so much on international lines within the time For this it is under a deep debt of gratitude to the Rockefeller Foundation of New York without whose financial assistance much would have been impossible As far as Asia Australasia and East Africa are concerned the sphere of activity, connected with epidemiological intelligence has now brought practically to our doors the details of the communicable diseases of 137 ports in that area up to within a few days of their occurrence

As Chairman of the Advisory Council of the Singapore Bureau and an original member of the Conference which set up this Bureau, I take this opportunity of testifying publicly to the extraordinary spirit of co operation which the Governments of the various countries concerned have shown by contributing their quota of information so readily and willingly Details of diseases which, four years ago might have appeared impossible to ascertain are now being freely communicated by weekly telegrams and broadcasts and published in the fasciculus

I need hardly remind you that the development of such conditions as these *is altering very materially the position in regard to the control of infectious diseases* by sea borne traffic I have always held that free international communications regarding what is happening in the world of infectious disease are an essential to any simplification of quarantine procedure Once the responsible quarantine officers of the various ports realize that they have before them a clear picture of the most recent happenings in other ports with which they are concerned then, and only then are they in a position to consider infected ships from infected ports in their true bearings Apart from the quantity and quality of this information and the speed with which it has been assembled, its systematic publication must add a stimulus to all Governments and major port authorities to regulate their port health policy so that a constant process of grading up may be embarked upon Meanwhile the fact that such information is available should be an incentive to every municipal authority abutting on a port to use every endeavour possible to control and if possible, eliminate preventible infectious disease by every means known A studied disregard on the part of any major port or adjoining municipality of the recognized precautionary measures over considerable periods must of

particularly in regard to the major infectious diseases, have been adopted. A small body of experts at Geneva and Singapore collects and checks the information and publishes it, whilst actual investigations are undertaken largely by experts in their respective countries and by other technical agencies. A perusal of the Geneva weekly bulletin and of the Singapore fasciculus will at once bring home to the reader the comprehensive and up-to-date nature of this information and the rapidity with which it has been assembled.

(*b*) *Various booklets* have been published dealing with the vital statistics of different administrations, e.g., Netherlands, Belgium, England and Wales, Spain, Austria, Portugal, Hungary, Scandinavia, whilst details of the various Health Organizations, e.g., Czechoslovakia, Ukrane, Australia, Germany, Hungary, Kingdom of Serbs, Croats and Slovenes, Japan, Latvia, Bulgaria and French Colonies have been prepared and published. A similar publication in regard to India has been prepared for the purposes of the coming interchange of health officials of the League of Nations in India.

(*c*) In regard to the *collaboration of vital statisticians*, the Rockefeller Foundation again came to the rescue by granting 31,000 dollars for this purpose. This resulted in a series of group conferences at Geneva and other places at which European experts have compared notes, discussed certain phases of the work, and arranged publications.

(*d*) The Rockefeller Foundation realizing the value of mutual understanding between the officers working the different national administrations contributed 60,000 dollars a year for three years to the League funds for the purpose of establishing *interchanges of public health personnel.* As a result a series of interchanges began towards the end of 1922 in Belgium, Italy, England and Austria. Since then interchanges have taken place in the leading European countries, in the United States of America, and in Japan. I am glad to say that the second one in the Far East is about to take place in India. For details of the number and scope of these and their work, the annual health report of the Health Section of the League must be consulted.

It may be asked what the value of this work is. In my opinion it is of much practical value to the participants if they are carefully chosen, in that they gain first-hand technical knowledge in their own subjects, benefiting specially from visits to the more advanced countries. It further helps to widen their hygienic horizon, to build up co-operation and to create a spirit of mutual confidence between the various national health administrations whose relations, in view of the extension of modern commerce, are often very intimate.

(3) *Co-ordination of scientific research* has so far been effected largely in connection with sera, serological tests and biological products, and in this our distinguished guest, Dr. Madsen, who, when he is not acting as Chairman of the Health Committee of the League, is Director of the State Serum Institute, Copenhagen, has played a very important part, more especially with regard to standardization of anti-diphtheritic sera.

in U S of America Whereas in the 1912 Convention, periodical deratization was recommended the 1926 Convention sought to make it compulsory, though fumigation *per se* has not been made compulsory for the grant of a deratization certificate—the technique to be employed being open to the sanitary authorities concerned All countries have been asked to undertake to watch and keep down the rat population in their ports New certificates are not to confer on a ship immunity from sanitary measures though every consideration will in the first instance be given to these until such time as the value of the certificates has been thoroughly tested These are all reasonable precautions and should not place undue obligations on a country which is troubled by plague even though it has a large trade In so far as British India is concerned the Convention is now being studied by maritime Governments with a view to ratification

Before leaving the subject of plague I should like to raise certain concrete questions regarding deratization and fumigation as I think the meeting in this section presents a favourable opportunity for the discussion of certain aspects of this question The points which specially appeal to me apply mainly to the role of the domesticated rat and are —

(*a*) The question of the infectibility of certain ports outside the usually recognized infectible latitude of 40 north and 40° south
(*b*) The reasons for the failure to permanently infect certain ports into which plague has been introduced during the last 30 years
(*c*) The rôle of X *cheopis* and *X astia* in this connection
(*d*) The role of rat proofing of ships *vis à vis* deratization by fumigation
(*e*) The role of rat catching *vis a vis* deratization by fumigation
(*f*) The role of rat proofing ashore
(*g*) The need for fumigation and other measures of destruction in a rat free vessel which has had to call at infected ports
(*h*) The economic value of adult rat destruction as compared say, with adult mosquito destruction in yellow fever
(*i*) The effects of a first second and subsequent fumigation over a short period on the total rat population on a ship

Those of us who have considered the subject carefully have no doubt reached certain conclusions Personally, I feel that the measure of election is ship 'rat proofing during ship construction It was by certain alterations in ship construction that the changes in the distribution of yellow fever in the American sea board are said to have been brought about

The strongest argument to my mind in favour of rat proofing exists in the practical fact that a first fumigation does not as a rule kill more than 72 to 80 per cent of the rats on board The U S A has gone further than most other nations in this respect as the Navy, the Army transport service, and large numbers of private owners have already made practical use of rat proofing on new vessels

necessity lead to such a port being black-listed and penalized, and in my opinion quite rightly so.

Let us now turn to the work of the Paris Bureau or 'Office' in so far as it concerns the 1926 revision of the International Sanitary Convention. Let me remind you that Part I of this Convention, which is probably the most important, contains measures applicable to all countries; Part II to the Suez Canal, Red Sea and Persian Gulf; Part III to the Pilgrimages to Mecca; Part IV deals with the Egyptian Sanitary Maritime and Quarantine Board, and Part V with ratifications. The diseases dealt with are the major infectious diseases—plague, cholera, yellow fever, typhus and small-pox. The main features of the Convention are that it recognizes the right of every country to subject arrivals to medical inspection and quarantine relying on the condition of the ship on arrival, together with its history during the voyage, as the factors which are largely to determine the nature of any measures taken against it and whether it shall be classified as 'Healthy,' 'Suspected,' or 'Infected,' and further laying down the maximum action permissible against ships in each of the last two categories. It lays down the necessity for every country providing an adequate sanitary organization and equipment at one port at least on each of its sea-boards, of establishing in its larger ports an efficient sanitary service, of giving, through the Paris Bureau, information regarding their equipment and organization, and of providing prompt and complete information regarding Conventional disease outbreaks, their progress and the measures taken against them. It further obliges each country to give full consideration to such preventive measures as have been taken at the port of departure. Thus, the two main principles underlying it are the state of health and the sanitary history of a ship; but full and prompt information must be given by Governments regarding epidemic diseases in their countries and ports and the measures being taken against them.

Those of us who went through the various phases of the Paris Conference will be the first to admit the apparent difficulties of the task of producing a revision acceptable to all and the necessity for the large number of compromises which had to be made to effect it. This was met in some cases by special reserves in the protocol as for example in regard to compulsory notification of diseases in a country like India (Art. 8). Restrictions on merchandise were relieved to some extent and special reference was made to the necessity for prompt communication of full and accurate information, and, in this connection, to the rôle which could be and must be played by the various League and other Bureaux.

One of the most important points from the shipping point of view concerns the Articles dealing with plague and rats. The modern position regarding the relative dangers and shipping importance of rat plague and human plague has been accepted and incorporated, and with it its implications. This was inevitable and necessary.

A differentiation between deratization and fumigation was early indicated, specially in view of the work that has been and is being done 'on rat-proofing

Congress like this is the opportunity which it presents for visitors from epidemiologically clean countries to realize something of the problems which sanitarians in a country like India are up against

You will have noticed that our President, in his opening address touched briefly on this not unimportant aspect of our work in India Let me illustrate it more concretely Here in Calcutta with a population of 1½ million and conditions of medical practice which make compulsory notification of all infectious diseases as in Europe and America an impossibility, and with a Municipal Government which in these days of the reforms and local autonomy is largely Indian and very often non co operative in tendency, the problem of prevention of disease on modern lines becomes at once surrounded by great difficulties If we add to these the small numbers of qualified doctors the ignorance of the population, their prejudices and superstitions, religious and otherwise the want of a public health conscience in the community and the absence of driving force it will be realized how difficult it is to promise or even to anticipate Port Trusts are just as anxious here as elsewhere to keep their areas in apple pie order but the adjoining reservoirs of infection are only too difficult to control under present conditions, especially where Conventional diseases are concerned Fortunately yellow fever is absent from India Plague is not a disease of this port, but cholera is one of the bugbears and I hope that the Director of Public Health of Bengal will be able to describe to you something of what he is attempting in connection with the control of this disease

Our bibliography of cholera in Bengal is a large one and, coming to recent years the work of Fry, Rogers Brahmachari, Tomb, Maitra, Stewart and Bentley, together with that in the United Provinces under Lieut Col Dunn by Dr Saranjam Khan, and that in Madras under Lieut Col Russell all show that we are alive here to the problem of endemicity The work now being done has been brought to the notice of the Paris Bureau and of the League and both have published certain of the papers of our workers The value of oral bilivaccine as a preventive is being worked up for the League largely in Madras Bengal and the United Provinces, and when final results are attained, we shall hope to be able to make practical use of them on a large scale Lieut Col Russell s most recent paper has been discussed at the last November meeting of the 'Office' and has now been published by the League of Nations Dr Bentley's recent campaign, both by propaganda and inoculation, to control the disease in endemic areas is a feature of the attack on the disease in Bengal

In my annual report for 1924 I wrote as follows —

'Amongst major epidemic diseases this is our *bete noire* It focuses the attention of the rest of the public health world on India which is generally regarded—and correctly so—as one of the chief endemic centres of this disease Col Fry's recent paper, as well as those of Lieut Col Russell and others, leave little room for doubt on this point Cycle after cycle of recrudescence and effervescence have occurred since the days when such acute observers as Cunningham, Fayrer, Duncan,

Work at present in progress in Bombay and the United Provinces, it is hoped, will help towards a solution of the *cheopis-astia* question. A recent article by Dr. S. B. Grubbs, Assistant Surgeon-General, United States of America Public Health Service, has laboured the view that a change in living conditions has brought about the new distribution of plague as distinct from that in the middle ages. If, in accordance with Grubbs' conclusions, we wish to fix a *cheopis* index of infectibility for our Indian ports, it will be necessary to undertake a very complete flea survey of these ports just as has been undertaken on the American coasts. His contention that, when the *cheopis* index passes below 1 per rat—as it is said to do north of 40° latitude—a port may be considered safe, will require investigation with regard to Asia. He is rightly very strong on the necessity for attacking the breeding points and for building houses and stores ashore where no rat propagation can take place. Hirst's work on this is of the greatest importance.

The work of the Liverpool ship rat catchers during the last 20 years has helped to bear out the conclusion which all this would appear to lead to, namely, that a ship is not likely to be 'plague dangerous' unless a certain number of rats are on board, and, if we have evidence that they are not, then fumigation or any other form of deratization may be omitted. This, however, is complicated in Eastern waters by the risks which are being constantly run in plague-infected ports, specially where loading takes place, as in Rangoon, by lighters coming direct from the rice godowns which are heavily rat-infested.

If economic conditions are not sufficiently stringent to allow of firms ashore having rat-proof mills and godowns with a view to conserving their supply from destruction that is no argument for a *laissez-faire* policy, and it is hoped that the ratification of the Convention will bring such pressure to bear on the owners of such mills and godowns that the requisite rat-proof structures and a rat destruction campaign ashore will be brought into existence. It would seem reasonable to suggest that deratization by fumigation should be required for every ship showing any rat infestation or any appreciable rat harbourage if the vessel comes from an infected port. We must, however, remember that purely academic theories of infection should not influence us too much in framing measures and that we must be guided in regard to what to avoid, not so much by laboratory demonstrations as by practical experience, otherwise our quarantine is likely to become unduly irksome.

I should like to touch on some practical points in connection with the working of the Convention.

(1) Sanitarians generally will be the first to admit that the point of view of a heavily-infected country, which might almost be called a reservoir of infection, must be to some extent fundamentally different from that of a clean country. Countries in the latter category, such as Australia, no doubt feel justified in imposing very severe restrictions on shipping from the infected ports of a country like India: I venture to suggest however that one of the most valuable aspects of a

disease amongst them The recommendations as a result of their report will when adopted grade up this aspect of Port Health work to Western levels

(6) Rangoon one of the largest immigrant ports in the world receives a monthly average quotum of 24 000 immigrants from India Though it is part of British India and though this traffic is internal traffic her problem is essentially the same as that of Malaya

(7) Our Sunni Mahommedan pilgrim traffic out of India to Jeddah has been brought under control by the Indian Pilgrims Act (now the Indian Merchant Shipping Act 1923) the Articles of which are being brought into line with the recent Anglo Dutch Convention A reference to the regulations in regard to this traffic will be sufficient to indicate the degree of control which is exercised in regard to ship accommodation provisioning and control of Conventional diseases In this connection it is very satisfactory to feel that our Netherlands East Indies colleagues who are specially interested in this traffic have seen eye to eye with us in the control exercised the principles of which have been embodied in the recent joint instrument signed in Paris in June 1926 the Anglo Dutch Convention

(8) With the present machinery of the League in Geneva and Singapore and of the Bureau in Paris with the advent of broadcasting by wireless and the increased activities displayed by keen and epidemiologically clean nations dirty offenders must needs be in the pillory and I have no brief for defending India in this respect We in India cannot in regard to freedom from disease claim the experience of Japan at her quarantine station of Moji where between 1915 and 1924 inclusive 41 879 ships with 5 957 887 persons were inspected and only 52 cases of notifiable disease discovered My advice already freely given has been on the side of grading up in every possible way both municipally and in the ports

(9) Within the last few months the Commerce Department of the Government of India has been engaged in revising the schedules of medical stores and equipment necessary for various categories of ships trading in Indian waters In the revised schedules cognizance has been taken of the alterations in the new Convention more especially in regard to protection of deck passengers by anti cholera and anti plague inoculations though in the case of the latter due weight has been given to the presence of a recent certificate of deratization on board the vessel

(10) Drs Bentley and McVail will I hope tell us what they are doing in regard to the cholera menace in what is recognized as a highly endemic centre Lieut Col Houston will tell us his experiences in regard to procedure with reference to plague in Bombay and Dr Crow will tell us the results of his experience in Rangoon We have also with us Dr Scharff, Dr Gautier Dr Tskey and other experts whose voices I hope to hear raised in this discussion We have with us Dr Heiser whose unrivalled experience in Manila we shall be glad to tap and with him several other officers of the United States of America quarantine service from whom we hope to hear something of how that other Conventional disease—yellow fever—has been brought under control in Central and South America

Herbert, Banks—and coming to more recent times—King, Simpson, Rogers, Greig and others tried to concentrate on this problem. The cycles still occur leaving many of the problems still for solution. With a daily increasing interchange of epidemiological information European, Dominion, and Colonial Governments have begun to look critically at the efforts made in India to cope with this scourge. Many of these nations are only beginning to realize for the first time the vast amount of work in this field which has been accomplished in the past by the Indian Medical Service and other Indian medical agencies ; but the point of view is altering and in future it may be that the best international medical brains may be required to solve the big problems. The Government of India, through the Indian Research Fund Association and Scientific Advisory Board, has not been oblivious to its responsibilities in this as has been already pointed out.'

(2) *Smallpox.*—In 1925 in the city of Calcutta with a population of 1,077,264, 32,937 primary vaccinations and 224,048 revaccinations were done. The crux in regard to this disease is largely one of failure to revaccinate, and is complicated by the flow of emigrants into Calcutta from the surrounding districts. There is no serious objection to vaccination either in the presence or absence of epidemic conditions ; but revaccination requires much propaganda, and usually epidemic conditions have to occur before numbers rise appreciably. The Directors of Public Health and the Medical Officers of Health of the ports have, when occasion arose, by propaganda, Government notification and otherwise, warned all concerned of the necessity for revaccination and have instituted on many occasions intensive campaigns of revaccination as distinct from the annual routine vaccination work. Thus, in 1925, the total revaccinations in India rose from 1,652,394 to 2,463,338, all provinces except Delhi and Bombay showing increases. So long, however, as vaccination is not compulsory under the English Act, the argument can be applied by Indians to Indian conditions ; but, with the adoption of compulsory notification in certain areas and municipalities in India, much will in future be able to be done.

(3) Though the matter has been carefully considered we have as yet no modern organized quarantine station here, and a decision must be arrived at in regard to it so soon as the Convention is ratified. To some extent there is some justification for its absence in view of the facts I have presented to you which show that this city is almost a perennial focus of cholera and smallpox.

(4) In order to meet the wants of all health officials in India in regard to current epidemiological information, a weekly printed Bulletin is issued in two parts from the office of the Public Health Commissioner with the Government of India.

(5) The work being done in Europe under the Joint Maritime Commission on 'Port conditions and the mercantile marine' is not without interest for us in India. Last winter our major ports received a deputation of the British Social Hygiene Council to investigate the conditions obtaining in regard to the provision for the mercantile marine ashore and for the free treatment, on modern lines, of venereal

QUARANTINE CONDITIONS IN THE PORT OF CALCUTTA

BY

J BORLAND McVAIL
Port Health Officer, Calcutta

IT is first desirable to explain what is meant by 'The Port of Calcutta' The Port itself is bounded on the north by a line drawn due east across the Hooghly from a pillar at the southern boundary of Messrs D Waldie & Co's Chemical Works at Konnagar on the right bank to a pillar on the left bank near Panihati

On the south it is bounded by a line drawn from a masonry pillar at the mouth of the Budge-Budge Khal to a pillar on the right bank bearing N W Inc[illegible] within the port are the shores within 50 yards of high water mark at spr[illegible] the Kidderpore Dock area, Tolly's Nullah from 25 feet to the west of [illegible] Bridge, and also all the area of the Petroleum Depôt at Budge Bu[illegible]

The approach to the Port from the sea begins officially at the [illegible] on a line drawn east and west of the Eastern Channel floating light [illegible]

These are the boundaries as laid down by Government and [illegible]ment to describe first what happens in the case of incoming vessel[illegible] ports These come into touch with the Port at the Sandheads wh[illegible] Brig is stationed and there they are boarded by the pilot The [illegible] Service is [illegible] Government service, is indeed the oldest of all the [illegible] Beng[illegible] and the Pilot once on board is not merely a navigat[illegible] Ma[illegible] but is for quarantine purposes actually in charge o[illegible] respon[illegible] only to Government for his actions This is a [illegible] up[illegible] quarantine position in Calcutta For a distance [illegible] and for a [illegible] of time which may extend from 10 to 48 [illegible] tides, the incoming vessel is in charge of a [illegible] of his first duties on boarding is to require [illegible] or the ship's Surgeon as to the health of [illegible] the voyage The penalty for delib[illegible] to the pilot is a deterrent one, exten[illegible] The original written statement [illegible] him in his boat to the Pilot B[illegible] as Senior Officer, Sandheads [illegible]

I hope you will realize from this that those of us who are responsible in India are working against great difficulties to try to grade up procedure in the larger ports.

I apologize for having inflicted upon you such a long story before arriving at the present position as much of this must have been familiar to most of you. I have done so with the purpose of concentrating attention largely on the reasons for the situation that has now been reached and with a view to provoking a discussion on the merits or demerits of certain axioms accepted by the Convention, but in regard to which the experiences of those of you here to-day who have to deal with trade in Eastern waters will be specially valuable.

there is always the chance of the Port, and of India generally, becoming infected through these contacts The point of view appears to have been that there was little possibility of introducing disease which is not already almost constantly present in India, and that as there is no control over transport of disease by railway it is not worth spending money on the Port alone but this view is now abandoned and the provision of a quarantine station for the Port is now under consideration by Government

Now as to the conditions within the Port Passengers are disembarked either at Outram Ghat or at the Calcutta jetties or they may be evacuated by launch at Garden Reach Cases of infectious disease are removed by a launch of the Port Health Department, landed at Outram Ghat and taken by infectious diseases ambulance straight to hospital Cargo is discharged at the jetties or into lighters In the case of plague-infected ships this has to be done under surveillance of an Officer of the Port Health Department There are two Clayton machines in barges in the Port One belongs to the B I Company who fumigate their foreign going ships here regularly The other belongs to the Port Commissioners The Port Commissioners it is to be noted are an entirely separate organization from the Port Health Department, the latter being under Government alone Fumigation of ships for rat destruction is supervised by an officer of the Port Health Department though the work is actually done by the Port Commissioners or by the B I Company

All foreign going vessels contribute on a tonnage basis to the Port Hospital Dues Fund and out of this fund the hospital expenses of sick officers and seamen are paid At present the contribution is levied at the rate of 3 pies per ton This can be increased up to one anna by order of Government The Port Hospital Dues Fund is also the fund from which the expenses of the Port Health Department are met, and the Government of India and the Port Commissioners make a contribution to it for this purpose This is a thoroughly bad arrangement, for money paid into the Port Hospital Dues Fund is primarily for the purpose of treating sick seamen In 1923 owing to a bad epidemic of dengue which apparently started in Kidderpore docks the cost of treatment of the sick was so high that the fund went bankrupt, and just at the time when most vigilance was required, the work of the department had to be cut down as there was no money to buy coal for the launches and even the staff had to wait for their pay This has been pointed out to Government and it is hoped that a new arrangement will be made at an early date

Loading may be done either from lighters in the river or at river jetties, but the bulk of cargo is shipped from Kidderpore docks. The Kidderpore dock area is entirely under the Port Commissioners who are responsible, among many things for the sanitation there There have been many complaints in the past about the health conditions in these docks The [illegible] owing to the local conditions is not an easy one In the first place the water which supplies the docks is pumped from a highly polluted source. This is known as the Boat Canal into which [illegible]

show that the vessel is 'suspected' or 'infected,' the pilot obtains all further requisite particulars and hoists the appropriate flag signals and the Senior Officer, Sandheads, sends the facts to the Port Health Officer by wireless. Should there be no cause for suspicion, the vessel is regarded as presumably healthy. Should the pilot, subsequently to receiving this declaration, have cause to believe that the vessel is not healthy, it is his duty to bring the ship to anchor well off shore, at Diamond Harbour, if possible, to wireless or signal the facts to Calcutta, and then to await instructions. In certain instances such as suspicion of yellow-fever or of heavy infection with certain other diseases, the vessel must as a routine measure be brought to anchor off Diamond Harbour. In other cases, all ships except oil-tankers for Budge-Budge are brought to Garden Reach. Suspected and infected ships are then boarded by the Port Health Officer or one of his gazetted assistants who may according to circumstances either grant immediate pratique, or delay the vessel until cases have been evacuated and quarters disinfected, or he may order the ship to quarantine moorings at Matiabrooze, or even in certain cases direct her to be taken back to Diamond Harbour.

Until pratique has been granted, no communication with the shore is permitted. Healthy vessels which have given no cause for suspicion need not be boarded by the Port Health Officer, but, usually, and whenever feasible, such vessels are in practice boarded at Garden Reach in order to satisfy ourselves that nothing has been missed. The advisability of boarding vessels ourselves has been increased by the recent order by which officers, including ships' surgeons of P. & O. and B. I. boats, are forbidden to mix socially and join in games with the passengers. In a ship in which I was recently a passenger, the ship's surgeon was entirely unaware that there was an outbreak of mild whooping-cough among the children in the first saloon and other disease might be even more easily missed. A vessel otherwise healthy on which unusual mortality among rats has occurred is classed as an infected vessel but not always justly. We recently had a ship arrive in Calcutta from Rangoon in which heavy rat mortality was certainly not due to plague, as proved in the Bengal public health laboratory and was almost certainly caused by carbonic acid gas from a load of damp and fermenting vegetable cargo.

There is no land quarantine or observation station attached to the Port. Cases of infectious disease are sent to the Campbell hospital, and also a few immediate contacts if the hospital can accommodate them, but the Campbell hospital accommodation is very limited. There is apparently no limit to the time during which ships may be kept at quarantine moorings or at Diamond Harbour, and a vessel may always put to sea again if dissatisfied, but the indefinite detention of a ship is bad for the trade and reputation of the Port, and it is frequently necessary to make a compromise by removing the sick and letting the contacts go. Surveillance is usually practicable in the case of first and second class passengers but in the case of deck passengers, who may not be sure of their own destination, and would probably lie about it if they did know, surveillance is not possible and

slightest doubt reference by the person's medical attendant to the Port Health Officer is always made in good time European health faddists, faithcurers anti vaccinators etc , are uncommon in Bengal and to use Mr Punch's phrase are generally referred to as ' the late ' On the home run the only third class or deck passengers are personal servants and their employers see to it also that they are as far as possible beyond suspicion There are few Indian cabin passengers from Calcutta for ports abroad and they are all of the educated classes There is a Medical Inspectress on the Port Health Staff who has the powers of rejection of an Assistant Port Health Officer and purdah ladies and children are examined by her One has nevertheless got to be careful Recently an Indian cabin passenger for Rangoon was accompanied by a child with adherent scabs of small pox The case was rejected by the Inspectress He was indignant and came to my office a few days later with a certificate signed by a well known I M S Officer to the effect that the child was free from infection and asked me to countersign this so that he would have no further trouble from my assistants Of course I refused He then asked if he might bring this child to be examined by me in my office so that I might countersign this certificate I again refused The child was then brought with the certificate to Outram Ghat at the next sailing and was again rejected after which he sent me a solicitor's letter I saw the I M S Officer and learnt from him that he had appended to his original certificate a description of the child examined by him This was removed by the would be passenger before the certificate was produced to us Evidently a healthy child had been substituted for the purpose of obtaining a certificate

Three mail boats a week sail for Rangoon These may carry over 1 000 deck passengers at a time All are inspected before embarkation There are also a fair number of deck passengers for Singapore When Calcutta is infected with small pox these are vaccinated before embarkation When Calcutta is declared infected with epidemic plague then in the case of foreign going vessels the clothing, bedding etc of all deck passengers and of Asiatic and African members of the crew who are not officers are disinfected by steam For this purpose we are provided with three conveniently situated steam disinfectors, two in the docks and one in the passenger rest house near Outram Ghat The Port Health Officer has powers to disinfect other articles of any sort which he considers may convey infection including the personal effects of higher class passengers and officers Certificates of what has been done are attached to the Bill of Health

For the last two years Calcutta has been opened for pilgrim traffic and special regulations apply to pilgrim ships Pilgrims are, as far as possible kept under observation from the time of their coming down to Calcutta to the time of their embarkation and are usually successfully persuaded to accept vaccination and anti cholera inoculation before going on board We have [illegible] to do this by summary order, but Government is cons[illegible] of all passenger vessels leaving the Port having to carry [illegible]

least one stream little better than an open drain empties itself, and which derives its water from Tolly's Nullah, a dying stream.

Ships in docks must keep water closets locked, officers and men alike having to use shore latrines but much cargo is brought over from Howrah by lighters and hundreds of these may be seen at one time in the docks. Each lighter carries a crew of four or five men and no sanitary control over these men can be maintained. They foul the water as they please.

Moreover at the coaling berths all coal is put on board by contractors' coolies and hundreds of these with their wives and families live in primitive conditions inside the dock itself and, instead of using the latrines provided for them, prefer to defæcate at the water's edge. Any attempt at coercion is liable to be followed by a strike and consequent delay to the shipping. The Port Commissioners are spending large sums on improving the latrine accommodation and other sanitary measures, but the effluvium from the dock water during the hot weather is unpleasant, flies are a plague, as also are mosquitoes, and there is much sickness among the seamen. It is hoped that conditions will be much ameliorated when King George's dock is opened as then it will be possible to change the water in Kidderpore dock more rapidly, and to obtain the water from a cleaner source, namely, the river Hooghly itself.

Cholera is endemic in Calcutta, chiefly among Hindus who are not a sea-going community as they lose caste below Saugor. Smallpox is present and epidemic every year. Plague has not appeared since 1923. Yellow fever has never been reported and there seems to be some doubt if the number of *Stegomyia* mosquitoes is sufficient to permit this disease assuming epidemic form. There are strict regulations as to reporting cases of infectious disease on ships in the Port, and hospitals also report to the Port Health Officer as soon as a diagnosis has been established. There is no one Sanitary Authority in Calcutta. The sanitation of the city is under the Corporation, an elected body with an Indian majority, the health officer himself being at present an Indian. The same applies to the municipality of Howrah. The Port Commissioners are responsible for the sanitation of the docks and jetties and the Port Health Officer has only power in connection with the sanitary conditions on board a vessel itself. Fortunately, the relations between the Chairman, Port Commissioners, and the present Port Health Officer have always been of a friendly and co-operative nature, but this divided authority does not make for efficiency. There is a Calcutta Board of Health which exists to advise Government of the presence of, or freedom from, infectious disease in the city area but this body has no executive power.

After this very brief summary of conditions affecting incoming vessels and vessels in the Port, we may now consider out-going vessels. Every person leaving the Port of Calcutta by sea must be medically inspected before embarkation. With Europeans we have no trouble. The inconvenience of having one's plans abruptly and forcibly altered by being rejected at the medical inspection is in itself enough to insure that no cause for this shall be given, and if there is the

DE RATTING OF SHIPS.

BY

C G CROW, I M D,
Port Health Officer, Burma Rangoon

'ENGLISH quarantine legislation is less restrictive than that of any other country and it has been criticized as being due partly to the pressure of powerful commercial interests in the country and partly to a national tendency to a policy of *laisser faire* Both of these criticisms can be refuted for we do all that is necessary and practicable in the present state of knowledge to protect the public health of our own country from the importation of dangerous epidemic diseases

It is not suggested that every country should adopt our procedure and no more but it is strongly urged that quarantine restrictions should be exactly in proportion to the dangers that exist in fact and not in theory Quarantine legislation should also be protective and not aggressive

Another problem is the fumigation of ships for rat destruction which is a health measure of first importance There is no doubt that many fumigations practised in various parts of the world can only be described as a farce There are many points in favour of the periodical fumigation of ships at regular intervals of six months which is demanded by some countries but it is a grape shot method of attack lacking the precision that modern scientific method should aim to achieve In the United Kingdom vessels are fumigated if there is the slightest suspicion of rodent plague on board for the rest fumigation is ordered when there is evidence that the rats on board are numerous In Liverpool the necessity for fumigation is based upon the report of the rat catchers and rat searchers who are specially trained to examine ships and to report on the degree of rat infestation This combined with efforts to prevent the passage of rats from the ship to the shore and the elimination of rat harbourage on the quays, gives very satisfactory results Its success depends upon a skilled and trained staff which is trustworthy, and it is at least a more rational procedure than placing complete confidence in routine fumigation of all ships every six months and of every ship from a plague-infected port regardless of any other consideration

The above is abstracted from an article on 'Some consideration in regard to the International Aspect of Quarantine Regulation written by Dr E W Hope of Liverpool'

anti-plague and anti-small-pox vaccines to inoculate every person on board in emergency.

This very brief summary of quarantine conditions affecting the Port of Calcutta is all that time at present permits, but I shall be very happy to give further information on any point to any member interested who cares to make an appointment.

1924—*contd*

Date	Name of vessel	Cost of fumigation	20 traps Number of rats trapped in one night before fumigation	Number of rats killed by fumigation	Cost per rat killed by fumigation		
		Rs			Rs	As	P
	B forward	990	B forward	46			
8- 4-1924	S S 'Mandra'	390	Not trapped	5	78	0	0
12- 6-1924	„ 'Nalgora'	450	„	8	56	4	0
10- 7-1924	„ '*Betwa*'	179	*Nil*	2	89	8	0
31- 7-1924	„ 'Ben Mohr'	330	Not trapped	9	36	10	8
25- 8-1924	„ '*Ganges*'	275	*Nil*	2	137	8	0
2 9-1924	„ 'Yorkshire'	175	Not trapped	*Nil*	175	0	0
3- 9-1924	„ '*Arankola*'	220	7	450	0	7	9
12- 9-1924	„ 'Malman'	330	Not trapped	9	36	10	8
7-10-1924	, '*Hatipara*'	450	1	7	64	4	7
10-11-1924	„ 'Hamburg Maru'	140	Not trapped	5	28	0	0
12-11-1924	„ 'Hatarana'	390	„	3	130	0	0
11-12-1924	„ 'Nalgora'	510	„	17	30	0	0
24-12-1924	„ 'Sang Bee'	330	„	57	5	15	5
	TOTAL	5,159	TOTAL	620	Rs 8-5-1 per rat		

1925

Date	Name of vessel	Cost of fumigation	Number of rats trapped	Number of rats killed	Rs	As	P
6- 1-1925 .	S S '*Indo Maru*'	140	*Nil*	2	70	0	0
11- 2-1925	„ '*Megna*'	330	1	7	47	2	3
19- 2-1925	„ '*Sally Maorsk*'	275	2	11	25	0	0
23- 2-1925 .	„ 'Ganges'	275	Not trapped	2	137	8	0
6- 3-1925 .	„ '*Haque Maru*'	275	*Nil*	5	55	[illegible]	0
15- 3-1925	„ '*Tapti*'	390	*Nil*	2	[illegible]	[illegible]	0
	Carried over	1,685	Carried over	29			

The vessels in *italics* in the accompanying tables were trapped with 20 rat traps for one night. The traps were distributed, 10 in storeroom, 5 in the galleys and 5 in the crew's quarters; the catches are given alongside with the cost in rupees for each rat destroyed by fumigation.

The results obtained more than bear out Dr. Hope's opinion that grape-shot methods of fumigation are expensive and lack precision.

The cost of these fumigations are borne by shipping companies to comply with rules in force in different countries. If the number of rats destroyed is taken as a criterion of rat infestation, then fumigation, its cost, and the delay to the ship is not justified, particularly as trapping failed to elicit any undue rat population in some of the vessels. Rat-trapping and rat-searching can always be relied on to give an index of the numbers of rats on any vessel. It is not intended to imply that trapping and rat-searching for one night is sufficient, but the figures give some indications. Ships apply one day and must be fumigated the next, it has to be got through and the sooner the better, hence only one night catches are available. Commanders of some vessels have told me that by making, as far as possible, the storeroom, the galley and crew's quarters rat-proof, a considerable difference is noticeable in the numbers of rats on a ship. Each of these places are made separate by filling in all openings with gauze wire mesh, and taking particular care that all doors and other openings close tight and are well fitting. By making each compartment separate, the movement of the rat is very much restricted, he finds difficulty in getting food and water, and a place to nest.

It might be necessary to add that rat-proofing interferes with ventilation and is considered a hardship by crews in the tropics.

Statement showing the number of vessels fumigated at the Port of Rangoon, cost realized and rats killed on each vessel during the years 1924 *to* 1927.

1924.

Date.	Name of vessel.	Cost of fumigation.	20 traps. Number of rats trapped in one night before fumigation.	Number of rats killed by fumigation.	Cost per rat killed by fumigation.		
		Rs.			Rs.	As.	P.
16-1-1924 ..	S. S. 'Lady Blake'	175	Not trapped	17	10	4	8
16-2-1924 ..	„ 'Hughli'	275	„	5	55	0	0
21-2-1924 ..	„ 'Warla'	220	„	21	10	7	7
11-3-1924 ..	„ 'Kalomo'	320	„	3	106	10	8
	Carried over ..	990	Carried over	46			

1926—*contd*

Date.		Name of vessel	Cost of fumigation	20 traps Number of rats trapped in one night before fumigation	Number of rats killed by fumigation	Cost per rat killed by fumigation		
			Rs			Rs.	As.	P.
		Brought forward	2,655	B forward .	222			
19- 6-1926	..	S S 'Aronda'	220	Not trapped	66	3	5	4
23- 6-1926	..	„ '*Edavana*'	275	4	156	1	12	2
24- 6-1926	..	„ 'Chilka'	220	Not trapped	25	8	12	9
30- 6-1926	..	„ 'Ekma'	275	„	66	4	2	8
14- 7-1926	..	„ '*Crosby Hall*'	275	*Nil*	*Nil*	275	0	0
5- 8-1926	..	„ '*Yorkshire*'	390	2	7	55	11	5
24- 9-1926	.	„ 'Sir Harvey Adamson'	140	Not trapped	4	35	0	0
8-10-1926	..	„ '*Baron Ruthven*'	275	*Nil*	*Nil*	275	0	0
22-10-1926	..	„ '*Sunland*'	330	*Nil*	5	66	6	0
12-11-1926	..	„ 'Yorkshire'	175	Not trapped	2	87	8	0
14-11-1926	..	„ 'Garmula'	330	„	4	82	8	0
		TOTAL	5,560	TOTAL	557	Rs 9-15-9 per rat		

1927.

Date.		Name of vessel	Cost of fumigation	20 traps Number of rats trapped in one night before fumigation	Number of rats killed by fumigation	Rs.	As.	P.
8- 1-1927	..	S S '*Sanuki Maru*'	175	*Nil*	2	87	8	0
29- 1-1927	..	„ '*Baron Belhaven*'	390	1	5	78	0	0
17- 3-1927	..	„ 'Chenab'	275	Not trapped	7	39	4	6
25- 3-1927	..	„ '*Mattappo*'	330	*Nil*	2	165	0	0
27- 3-1927	..	„ 'Ilona Seimers'	275	Not trapped	2	137	8	0
12- 4-1927	..	„ '*Cape Cross*'	330	1	4	82	8	0
8- 6-1927	..	„ 'Seattle Maru'	175	Not trapped	4	43	12	0
18- 6-1927	..	„ '*Tresellion*'	390	*Nil*	2	195	0	0
25- 7-1927	..	„ '*Baron Lovat*'	390	*Nil*	*Nil*	390	0	0
26- 8-1927	..	„ 'Aronda'	220	Not trapped	37	5	15	1
		TOTAL .	2,950	TOTAL ..	65	Rs 45-6-2 per rat		

1925—*contd.*

Date.	Name of vessel.	Cost of fumigation.	20 traps. Number of rats trapped in one night before fumigation.	Number of rats killed by fumigation.	Cost per rat killed by fumigation.		
		Rs.			Rs.	As.	P.
	B. forward .	1,685	B. forward ..	29			
19- 3-1925 ..	S. S. 'Yorkshire'	175	Not trapped	2	87	8	0
20- 3-1925 ..	" '*Khosru*'	275	*Nil*	3	91	10	8
5- 4-1925 ..	" 'Indo Maru'	220	Not trapped	2	110	0	0
13- 5-1925 ..	" 'Betwa'	275	"	5	55	0	0
11- 5-1925 ..	" 'Lady Blake'	140	"	14	10	0	0
29- 7-1925 ..	" '*Silijan*'	330	1	8	41	4	0
19- 8-1925 ..	" '*Coconada*'	275	3	56	4	1	6
7- 9-1925 ..	" 'Seattle Maru'	140	Not trapped	5	24	0	0
7-10-1925 ..	" '*Sanuki Maru*'	275	2	5	35	0	0
20-12-1925 ..	" 'Betwa'	175	Not trapped	2	137	8	0
	TOTAL ..	3,965	TOTAL ..	131	Rs. 30-4-3 per rat.		

1926.

Date.	Name of vessel.	Cost of fumigation.	20 traps. Number of rats trapped in one night before fumigation.	Number of rats killed by fumigation.	Rs.	As.	P.
6- 1-1926 ..	S. S. 'Sanuki Maru'	220	Not trapped	5	44	0	0
2- 2-1926 ..	" '*Cape Cross*'	330	1	7	47	2	1
10- 3-1926 ..	" 'Cargo Boats' Nos. 890 & 901.	280	Not trapped	20	14	0	0
17- 3-1926 ..	" '*Rubens*'	330	*Nil*	*Nil*	330	0	0
21- 3-1926 ..	" '*Nicoline Marsk*'	390	1	*Nil*	390	0	0
11- 5-1926 ..	" 'Ganges'	275	Not trapped	*Nil*	275	0	0
12- 6-1926 ..	" '*Arankola*'	220	3	144	1	8	5
13- 6-1926 ..	" 'Megna'	390	Not trapped	2	195	0	0
16- 6-1926 ..	" 'Ethiopia'	220	"	44	5	0	0
	Carried over ..	2,655	Caried over ..	222			

zones of Colombo and neglecting the *astia* areas we have succeeded more than once in completely or almost completely eradicating the disease We operate on the concentric principle of attack upon the potentially plague infested foci defined on a flea species basis on much the same lines as Dr Heiser in his successful anti plague campaign in the Philippines Dr Heiser however, used an intensive rodent plague infection survey as a means of localizing the plague infected foci upon which plague preventive measures were concentrated working from without towards the centre of each infected focus thus marked out

Plague in Colombo is closely correlated with the distribution of *cheopis* infested grain In the Government granaries and Customs premises there are upwards of 50 per cent *X cheopis* as a rule upon the rat in the subsidiary grain stores on the plague infested zones *X cheopis* ranges up to 25 per cent on the fleas collected at the out skirts of the town there are less than 2 per cent *cheopis* found upon the rat the remaining fleas being *X astia*

Unfortunately the infection is liable to be re imported into Colombo from plague infected boats particularly Rangoon It is very disheartening to find as we did a year ago that after apparently eradicating the disease throughout the city as far as we could judge from the results of an intensive rodent survey the infection was once more introduced into the import granaries The chain of infection could be clearly traced from ship to shore from shore to granary and thence into the interior of the city The first human case was a coolie handling rice bags from Rang[illegible] in the Government granaries which though nominally rat free are [illegible] infested with a moderate number of rats Methods of wholesale grain [illegible] are now under consideration of the Port Commissioners I sho[illegible] advice and information as to the most effective method for the [illegible] of grain by the cyanide process on a large scale from the members of [illegible] Association of Tropical Medicine

Finally may I point out that the *astia cheopis* question i[illegible] a much larger problem—the rat flea species factor in general [illegible] *C fasciatus L musculi* question is in some respects even [illegible] In the connection I should like to draw attention to a recent [illegible] Shanghai on the prevalence of the various species [illegible] I would be well if similar work was instituted in other [illegible] on the lines developed long ago by the Bureau of [illegible]

Dr V G Heiser (U S A) It has been a [illegible] ing paper of Col Graham as well as those th[illegible]

It has always been a matter of great re[illegible] backward as to make quarantine and [illegible] is still too much opinion in the adm[illegible] proved scientific procedures Utilizi[illegible] discouragingly slow The Singap[illegible] itself with studies that would te[illegible] work done by Dr Crubbs in [illegible] example in point The ex[illegible]

DISCUSSION.

Lieut.-Col. F. Bissel, I.M.S. (Burma): said that he did not quite agree with Col. Graham that the position as regards quarantine was the same in Burma as in Malay. Malay was a comparatively clean country, whereas in Burma not even the chief towns had a satisfactory water supply and the position of villages was even worse. In the rural areas of Burma, there was practically no sanitation and it was uncertain whether cholera was endemic or not. The ports were not the only possible sources of infection by cholera as for hundreds of miles Burma was bordered by China and Siam. It was, therefore, open to doubt if segregation of all immigrants at Rangoon would have the desired effect, and, for this reason, he had not pressed the Local Government to introduce the measure. It was true that since inspection of all immigrants was reintroduced at Rangoon in 1915 there had been a steady fall in the incidence of cholera in the Province and he himself was inclined to attribute the fall to the Port Health measures of inspection and disinfection, but against this was the fact that in 1905 when plague was first introduced into Burma, and a very rigorous quarantine was instituted of all immigrants from India, the Province continued to suffer severely from cholera during the year the measure was in force. He felt that, before segregation was instituted in Rangoon, further information with regard to the epidemiology of cholera in the Province was necessary.

Dr. L. Fabian Hirst (Ceylon): Col. Graham has referred to the international aspects of the *astia-cheopis* question. As the originator of the hypothesis that *astia* is a relatively inefficient carrier of plague, I should like first to point out that this theory has only limited practical application to the spread of plague in India. Col. Graham mentioned a recent rat-flea survey of the United Provinces. Now, I pointed out in 1923 at a lecture before the Royal Society of Tropical Medicine, and again in 1924, in a paper which appeared in the *Journal of Hygiene*, that the flea-species factor was unlikely to be of predominant importance in the northern plains of India, including the United Provinces. I ventured to predict before the results were available, that the coefficient of correlation between plague and *cheopis* prevalence in that part of India would be so low as to be insignificant. The results recently obtained by Dunn, as well as those reported earlier by Cragg, confirm me in this attitude. I think, however, that study of the periodicity of plague, climate and flea-species prevalence in the United Provinces would give valuable results, provided the right criteria were used. The part of India, in which I conceive that the practical application of the theory is of real importance, is the region bordering the coasts, what I called the maritime type of station. My arguments on this head are set forth in my recent memoir on the 'Parasitology of Plague.' I may be permitted to say that these biometric arguments have the support of Major Greenwood, the statistician to the National Institute of Medical Research and formerly to the Plague Commission.

Let us take Colombo as an example of the operation of the flea-species factor in a maritime station. I find that the distribution of *cheopis* in Colombo corresponds with plague in almost mathematical exactitude. This does not necessarily prove my above-mentioned hypothesis, since the infection and the rat population factors cannot be discounted with sufficient accuracy, but these discoveries afford a basis for practical plague preventive measures. By concentrating all our efforts on the *cheopis*-infested

third line, an organized health service to deal with outbreaks on the spot are so pitifully weak Again in Rangoon we deal with very large numbers—375 000 immigrant coolies in the year I understand from Dr Wellington that for an immigrant traffic of something like 50 000 he requires a quarantine station to take 9 000 persons On this basis it is obvious that we should require a very large station for Rangoon No one will dispute the fact that sooner or later we will require a quarantine observation station for Rangoon if we are to comply with the spirit of the 1926 Convention The whole question is *when*? On this point I cannot but feel that there are other things in more urgent need of doing such as improvement to our second and third lines of defence Still the matter is *sub judice* and I for one hope that we may obtain some helpful criticism from this meeting

The Hon ble Dr A L Hoops (Straits Settlements) (Chairman) Before calling on Dr McVail Dr Crow and Col Graham to close the discussion by speaking in the order mentioned he would like to make a few remarks

Major Jolly when he gave the figures for immigrants to Malay gave them for only one port those of Port Swettenham We have three great ports of entrance Singapore Penang and Port Swettenham all three possessing quarantine stations capable of comfortably accommodating 5 000 coolies each and more at a pinch Our immigrants from China alone in 1926 amounted to 373 000 and from Southern India to over 100 000 We have no endemic cholera or small pox In some years not more than 20 to 30 cases of either of these diseases occur in Malay It therefore pays us to quarantine Indian coolies for a week during which time they recover from their sea voyage are well fed and are treated for hook worm Most of the Chinese coolies come from southern ports of China, such as Amoy Foochoo and Swatow where outside the foreign concessions, there is no health service and where small pox and cholera are endemic These diseases not uncommonly break out in the coolie ships or amongst the passengers after arrival and it therefore pays us to quarantine them where their ports of departure are infected

Col J D Graham I M S (B India) replied Dr Crow in his paper referred to fumigation as being a grape shot method of attack but he did not emphasize the fact that most of the ships coming to Rangoon belonged to the category of regularly fumigated ships i e a large number were British India boats fumigated regularly by the B I operators others were home ships like P and O boats and Bibby Liners whilst others were Japanese Australian or Dutch boats disinfected by order of the various countries of origin This materially reduces the chance of large numbers of rats being found and after what Lieut Col Houston has told us easily explains the situation The more we fumigate the less the chances are of obtaining many or even any infected rats It however, bears out my contention in regard to rat proofing as being the method of election and the only rational procedure Moreover, the Convention recognized that some distinction should be made between fumigation and de ratization and it was largely in order that other methods of rat destruction should be recognized that this distinction was made

Lieut Col Bisset apparently disagrees with my contention that the Burma problem is not like that of the I M S, even though he is not sure that cholera is endemic and is

shown that the cabin class of passengers practically never convey any of the six major quarantinable diseases. In view of this experience, a further study seems desirable as to whether governments should be encouraged to provide accommodation at quarantine stations for high type cabin passengers. Dr. Hirst's researches with *cheopis* fleas may have considerable application in dealing with plague. In Palestine the application of his researches appear to have been followed by happy results. Builders of ships might well be encouraged to keep rat-proofing in mind. Reducing the *Aedes egypti* index to small proportions, would make quarantine restrictions in connection with yellow-fever unnecessary. The foregoing, perhaps, may suggest studies that would have application in the East.

In conclusion, may I express the hope that we endeavour to work harder in finding a way to do desirable things instead of contenting ourselves with excuses for their remaining undone.

Lieut.-Col. W. M. Houston, I.M.S. (Bombay) : was glad to note that Col. Graham placed importance on the practical experience of port health officers and not too much on laboratory experiment. He considered it impossible to prevent effectively rats from gaining access to ships under conditions such as exist in Bombay. He instanced an outbreak of plague on a P. and O. mail steamer with 17 attacks and 13 deaths in the Mediterranean, and about 110 rats were killed by subsequent fumigation at Alexandria. The rat population on the modern clean steamer was usually small, and periodic de-ratization would prevent such tragedies as the above. Fumigation for the purpose of de-ratization should be done thoroughly under reliable supervision or not at all. Even thorough fumigation by claytonization ordinarily killed only about 80 per cent of the rats. The question of ships getting infected with plague and other diseases in ports largely depended on local geography and conditions. In Bombay, for instance, the ships in dock lay within a few hundred yards of the city, and the P. and O. mail steamer actually lay about 100 yards from tenement houses heavily infected with malaria during the malarial season and the crews suffered accordingly. If the docks happened to be further off from the city, this risk of malaria would obviously be negligible. Rigid rules to keep out jigger by ships coming from East Africa were enforced, but he doubted whether the freedom of India from this disease could really be attributed to these measures.

Lieut.-Col. G. G. Jolly, I.M.S. (Burma) : The question of a quarantine station for Rangoon has received very close attention for some time. It is obvious that a clean country requires quarantine against a country heavily infected with all the quarantinable diseases and that the latter requires no quarantine against the former. The question is one of free trade versus protection. In Burma plague is endemic, small-pox is endemic, yellow-fever is a problematical danger, and only cholera remains to be considered. We are not yet certain if cholera is truly endemic in Burma or not. Dr. Heiser has referred to a feeling of shame that people should have to be put into quarantine and to the mistakes that have been made. In Burma we have made such mistakes, as mentioned by Col. Bisset, in connection with plague and we do not wish to repeat these mistakes by ill-considered restrictions on passengers. Quarantine is a front line of defence. It is open to question whether it is advisable to spend much money on this front line while the second line, which I would call environmental hygiene, and the

also keep rat infested godowns within a very small area the position is hardly creditable Godowns honeycombed with rat burrows where rats eat bags of grain per night are not unknown and must disappear before we can have improvement

The incidence of malaria at Bombay harbour illustrates the point I made in regard to the control of municipalities The central authority owing to the reforms has lost a certain amount of control over Corporations abutting on port property but this should be recovered to prevent infection within the docks from sources immediately outside

The question Major Jolly raised regarding a quarantine station is very important and I was glad to hear his remarks No doubt there are two sides of this question but it would be wrong to suppose that Major Jolly has shown the whole problem as it stands He forgot to mention that the Malayan Depots though dealing only with a certain amount of coolie traffic have the advantage of their emigration stations in India which are supported by the Governments of Malay and Ceylon In these Depots emigrants remain for long periods under observation prior to embarkation Thus a sieve is set up on the Indian side but not at Indian expense and yet in spite of this Malay finds it profitable to quarantine them for a certain number of days before admission to the country This is not without its lesson It would be a mistake to suppose as certain high officials in India have thought that there was little or no infectious disease on ships going to the Straits I demonstrated the large number of infectious cases which one single line (British India) could produce in six months and it was surprising One ship had 23 cases of cholera occurring on it The position can hardly be called satisfactory

Another point however to which we have directed attention is the possibility of combining an observation or emigration station with a quarantine station in the same area This is being considered in connection with the port of Vizagapatam and is a distinct advance in our Indian conception of what it is necessary to do for our overseas labour traffic At present when our public health service specially in the rural areas is so poorly developed and with little signs of developing rapidly it is essential that we use every means in our power to prevent the ingress of disease even if it be necessary to create temporarily quarantine stations

Dr Takuna of Japan has no doubt, to administer a very efficient [illegible] Dr Heiser refers to the fact that stools of large numbers of [illegible] I still think that this is a procedure which is beyond the capa[illegible] organization on economic lines and perhaps quite unnecessary [illegible] procedure to realize the difficulties which the Japanese have [illegible] I have spoken to Dr Tsurumi regarding this at the C[illegible] anxious to have restrictive regulations included in [illegible] would have prevented many nations adhering [illegible] behind us with our pilgrim traffic where we [illegible] enormously I should like the control so far [illegible] to be a more direct one than it is as o[illegible] obtained by the Dutch and Egyptian [illegible] from disembarkation at Kamaran [illegible] full ship complement has been [illegible]

prepared to accept a steady reduction in the cholera curve after a medical inspection was instituted. He still thinks that entry through the Chino-Siamese frontier, i.e., by the back door, more than counter-balances the good obtained by attempting to close the front door. I have seen the traffic at Bhamo and it is considerable, but it is only a fractional part of that entering by the front door. After what Lieut.-Col. Dunn told us yesterday in the cholera section regarding the effects of one single case of imported cholera in setting up an explosive outburst leading to over 6,000 cases, I think we may rest assured that money spent in keeping out that one case is well spent and we cannot afford to neglect it.

Dr. Hirst's contribution is very welcome, coming as it does from such an expert. He is apparently thoroughly satisfied that *cheopis*-infested grain from Rangoon is the cause of the entry of plague into Colombo. The work he has done in connection with the flea survey of Colombo is one which I should like to see universally applied throughout the major ports in India and I presume Dr. Hirst accepts my contention that a port flea survey, such as he has done for Colombo, is necessary for all principal ports (he agrees). I believe Burma has started this (Major Jolly agrees). The figures he gives for Rangoon rice infection with *cheopis*, namely, 70 per cent for Rangoon rice, 25 per cent for subsidiary rice and 2 per cent for rice taken from the outskirts, are very significant. It will be interesting to know the result of the proposals to disinfect the infected grain by means of a cyanide chamber. If I remember correctly, Dr. Smith in Manila used to disinfect boats by this method with cargo on board and declared that all cargo could be tackled in this way without damage except tea. I have not seen Dr. Hicks' work, but shall be glad to study it when opportunity occurs.

Dr. Heiser's part in the discussion was very welcome. I am glad to think that he endorses the opinion which I have tried to labour in my paper that we must bring a rational and intelligible application of our facts to bear upon the simplification of quarantine problem. Although he may cast aspersions on the British India Company's fumigation, which is not a Government operation, it would be wrong to discourage this under present conditions. It must be remembered that India has not ratified the 1912 Convention and that any voluntary fumigation done regularly is all to the good in keeping down the rat population on ships trading between infected ports. His suggestion that the Singapore Bureau should be encouraged to study the different aspects of the quarantine question, specially with regard to small-pox and plague, is a very important one, and I think a very suitable object for this Bureau. I agree entirely that we must use the facts which are abundantly available and translate them into quarantine procedure.

Lieut.-Col. Houston's long connection with port work, as our most senior port health officer, has naturally made his remarks very welcome as well as valuable. The rat population on a ship may be very small and yet may produce a very severe epidemic as was the case in P. and O. 'Nankin' in 1919. I spoke with the Chief Officer who agreed as to the value of regular fumigation.

The question of lighters is a very important one. The conditions in Rangoon leave much to be desired in connection with the infection of lighters from the godowns and when I see that certain firms are able to erect rat-free or practically rat-free and

THE SANITARY MANAGEMENT OF THE PRINCIPAL PILGRIM CENTRES IN THE BOMBAY PRESIDENCY.

BY

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The subject I have selected deals with the sanitary management of pilgrim centres, which extend in western India from Sehwan in Sind to Gokarn in the far South There are 9 important pilgrim centres in the Bombay Presidency and as the sanitary arrangements in all 3 places have been more or less standardized within recent years, I shall limit my remarks to only the 3 principal ones—Trimbak, Nasik and Pandharpur These three places were, till comparatively recently, looked upon as hotbeds of epidemic diseases, particularly cholera, and epidemics following in the wake of pilgrimages and spreading over the whole country were of much too frequent occurrence

The sanitary management of these festivals has engaged the attention of sanitarians in western India since the middle of the last century, but the bigotry of the people and vested interests of the priests proved a formidable bar to any substantial progress But within recent years, the growth of education among the people, and the enlightenment which has followed, has served to remove this bar to a marked extent, and, with the additional aid of a conciliatory policy adopted by the present day sanitarian, he has succeeded in carrying out schemes, perhaps planned by a predecessor half a century ago

In order to gain a clear idea of the sanitary requirements of a pilgrim centre, a knowledge of the rituals is necessary, and a sanitarian has to become something of a theologian as well Whatever belief one may individually hold, there is not a more fascinating study than is provided by the great religions of India

Festivals at Nasik and Trimbak

Barely 19 miles separate Nasik from Trimbak, and, for the purpose of this paper, I shall deal with these two pilgrim centres as one, since their sanctity arises out of the same legend and the pilgrimages at both are connected with the sacred river Godavari Nasik is a town with a population of about 30,000, situated on the Deccan Plateau about 120 miles north east of Bombay, and Trimbak is situated 19 miles to the west of Nasik, at the foot of the sacred Brahamagiri Mountain which is almost at the very edge of the Deccan Ghats.

to see the day when all overseas and Burma coolie passenger traffic was protected by such measures as inoculation prior to embarkation, i.e., under existing conditions of endemicity of cholera and small-pox. I think this is very necessary. I think I have answered most of the points and would thank you for your indulgence in letting me reply at such a length.

than in the cold weather or when the rush of pilgrims is small The following example will best illustrate the influence of contamination on the quantity of bleaching powder required During a certain festival 26 000 pilgrims visited Trimbak and had a bath in the Kushavarta This festival lasted 5 days The day before the festival commenced there was 110 000 gallons of water in the tank and the quantity of bleaching powder required was only 3 lbs After the festival began it was observed that the quantity of water decreased day by day but the quantity of bleaching powder required for thorough sterilization went up till on the last day the water in the tank had gone down to 75 000 gallons and the figures for bleaching powder had gone up to 50 lbs

As I have remarked the river runs through the towns of Trimbak and Nasik it passes through the inhabited areas in both thes places and is freely used by the residents as the family shrine and the family dust bin At Nasik the sullage from houses on the left bank of the Godavari and from the Aruna nullah (which is considered sacred) used to find its way to the sacred kunds In order to divert the sullage and protect the kunds from this source of pollution an intercepting drain was constructed by Government in 1920 at a cost of about Rs 40 000 But the provision of this drain led to an unexpected result—it stopped the flow into the most sacred kund of all the Ram Kund from the Gow Mukh (cows mouth) An effigy of the head of a cow is let into this kund and the flow of water from its mouth is considered sacred A stoppage of this flow meant a loss in the sanctity of the Ram Kund and led to a strong protest from the peopl The engineer and the sanitarian had to exercise all their ingenuity to find a [illegible] tion Ultimately an underground conduit connecting the Aruna nullah with the Ram Kund through a sand filter and a chlorinating chamber was con tructed and both the people and the sanitary authorities were satisfied Th[illegible] an example of grafting the science of the West on the prejudices of the [illegible] such means have often to be resorted to by the sanitarian in India *to en[illegible] the safety* of religious festivals

Conservancy —Efficient conservancy plays a very imp[illegible] par in the sanitary management of a religious festival and rapid remova[illegible] all excremen titious matter and efficient disposal helps greatly in preve[illegible] the inciden of disease

Disinfection —Phenyle kerosene oil emulsion and [illegible] crude oil their part in promoting efficient conservancy

Inspection of Food stuffs —Regular inspection of all [illegible] where fo[illegible] are either stored manufactured or exposed for [illegible] also a ma[illegible] importance

Housing —Most of the pilgrims visiting Na[illegible] and Trimb[illegible] [illegible] houses as lodgers Some the very poorest re[illegible] to charita[illegible] all over India as 'dharmashalas' and the[illegible] places have to be [illegible] by the sanitary officers *not only to see that* proper [illegible] rained but also to find out if any cases of epidemic diseases [illegible]

These two towns owe their sanctity to the Godavari River which rises from the Brahamagiri Mountain, is reputed to form the sacred tank of Kushavarta at Trimbak, flows through the town and passing eastwards goes through Nasik, traverses the whole peninsula, and enters the Bay of Bengal in the Madras Presidency.

Ordinarily it ranks third among the 5 sacred rivers of India and a pilgrimage to Nasik and Trimbak at any time confers merit on a devout Hindu. But once in 12 years, when the planet Jupiter enters the sign of the Lion (known among the Hindus as the ' Sinhasta '), the degree of sanctity attached to the Ganges and the Jumna is reduced and Godavari becomes the most sacred river in India during the 13 months. Hence, even though during an ordinary year a flow of pilgrims is continuous, rising and falling in numbers according to the sanctity of the occasion, it is during the Sinhasta period that vast crowds from all over India, from Hardwar in the far North to Rameshwaram in the remote South, visit Nasik and Trimbak. During the last Sinhasta (1920-21) over 500,000 visited these two towns.

Rituals.—Of all the many rituals the one that concerns the sanitarian most is the fact that every pilgrim visiting Nasik or Trimbak has to have a bath in the river and sip some of the water. At Nasik the river is divided into what are known as ' kunds ' where the water is impounded, and these form the sacred bathing tanks. At Trimbak the Kushavarta, which, as I have said, is believed to be a part of the Godavari, provides the place for the sacred bath. When it is realized that thousands of pilgrims have their bath in these sacred tanks as part of the ceremony, one can well imagine the degree of contamination the water undergoes and the risk the people run when they take their religious sip. In order to ensure the safety of this ritual, the sacred tanks are regularly chlorinated every evening before, during, and after each auspicious occasion and periodically emptied and cleaned.

Provision of a pure drinking water-supply and its protection is another item on which the safety of a pilgrimage depends. Nasik is provided with a pipe water-supply and the storage reservoirs are regularly permanganated during festivals, whilst in Trimbak, a chlorinated pipe water-supply has been installed since the last Sinhasta (1920-21).

Besides the pipe water-supply, a large number of wells at Nasik and Trimbak and on the roadside connecting these 2 towns are resorted to by the pilgrims. Attention to the cleanliness of the surroundings of these wells and permanganating them regularly during a festival are measures adopted to ensure their safety.

The amount of bleaching powder required to sterilize a sacred tank efficiently varies considerably from time to time and depends, apart from the quality of bleaching powder, on the season and degree of contamination. Bleaching powder containing 30 per cent available chlorine only is used, but more is required in the hot weather and after a larger number of pilgrims have bathed in the sacred tanks

When it is remembered that 500 000 pilgrims visited these two pilgrim centres during the 13 months these few cases of cholera among them cannot be considered a 'dire calamity'

During the same year (1921) a religious festival was held at Ujjani (Gwalior State) in May It lasted barely a week and accounted for about 20 000 cases In view of our experience at Nasik and Trimbak it would be safe to say that calamities of this kind need no longer be regarded as necessary concomitants of religious festivals The fact that although stray cases of cholera have occurred on different occasions since 1920 the disease has not taken an epidemic form either at Nasik or at Trimbak during the past seven years adduces a further proof of the value of the measures

Festival at Pandharpur

A town with a population of about 30 000 is situated on the river Bhima here called the Chandrabhaga and the town is about 145 miles south east of Poona Unlike the Godavari the Bhima is not one of the sacred rivers of India though a certain amount of sanctity is attached to all rivers in this country

Pandharpur is a place of pilgrimage not on account of the river but owing to the temple of Vithoba an incarnation of Vishnu which is situated in this town The first authentic accounts of this temple and this town date back to A D 83

This place has formed a constant source of anxiety to Government on account of its religious gatherings and the diseases which spread through these festivals and as far back as 1873 a general report on the sanitary requirements of Pandharpur was drawn up by the Sanitary Commissioner of the time But it was not till Col Hutchinson (now Major General Hutchinson C I E I M S Surgeon General with the Government of Madras) and our Assistant Director of Public Health Central Registration District (Dr Da Gama) tackled the problem in right earnest in 1917 that the pilgrimages at Pandharpur were rendered safe

On an average about 400 pilgrims visit Pandharpur daily and on ordinary Ekadashi days (11th day of the Lunar month) the number swells to anything between five and ten thousand But during the special occasions of Ashadhi and Kartiki festivals (July and October) the number may go up to anything between 100 000 and 200 000

The rituals a pilgrim visiting Pandharpur has to observe are —

1 Bath in the river
2 Pradakshina or visit to the 12 neighbouring temples
3 Worship of the God Vithoba
4 Ceremony at the temple at Gopalpur
5 Washing down of the temple
6 Fast on the Ekadashi day

Control of Epidemic Diseases.—Of the 4 prevalent epidemic diseases, plague, small-pox, influenza and cholera, that of most frequent occurrence, and the one most dreaded by the sanitarian, is cholera. In order to guard against it, telegraphic information is obtained from all the local sanitary authorities where the disease is prevailing or where it breaks out and communicated to the sanitary officers at Nasik and Trimbak. This practice puts the local authorities there on their guard and helps them to keep a watch on pilgrims coming from infected places.

Early Notification.—I look upon this as the most important measure in preventing the spread of cholera, and various means, like frequent inspection of lodging-houses, rewards to sweepers for reporting cases of epidemic diseases, are adopted to ensure early notification.

Removal of the Case to the Infectious Diseases Hospital.—Removal of a case of cholera to the infectious diseases hospital is optional and if the relatives are reluctant to remove the patient to the hospital, he is given treatment at the house and disinfectants are provided for the proper disposal of excrementitious matter. This is by no means a satisfactory practice and I far prefer the arrangement at Pandharpur where every case of cholera and all the contacts are removed to the isolation hospital.

Disinfection of Houses and Sources of Drinking Water-supplies.—After each case of cholera the belongings of the patient and the house where the case occurred are disinfected, the house is lime-washed, and if a well forms the source of the water-supply, it is sterilized.

Intimation to Local Authorities.—Before the contacts of any case of cholera return to their native places, an intimation is sent to the local authorities, and by wire, in cases of emergency.

Medical Inspection.—Special medical officers are appointed for inspecting pilgrims at the railway station, and in the towns during important festivals.

Results.—This gives a brief account of the sanitary arrangements introduced at Nasik and Trimbak in 1920 for the Sinhasta and which have been continued since. Now, I must say a few words about the results.

In the Sinhasta year of 1896-97, there was one severe epidemic of cholera in June 1897; during the 1908-09 Sinhasta, there were four distinct outbreaks. The Sinhasta year from time immemorial was associated with cholera in Nasik and Trimbak, as stated by Sir Leonard Rogers in his paper, 'The Forecasting and Control of Cholera Epidemics in India.' Whether the simple but effective measures I have just dwelt on have succeeded in dissociating cholera from the Sinhasta can be judged from the following figures. During the 1920-21 Sinhasta there were two outbreaks. At Nasik, the first outbreak was in August 1920 and accounted for 20 attacks and 14 deaths; the second which was in June 1921 was responsible for 7 attacks and 6 deaths. At Trimbak, there were 7 attacks and 5 deaths in July 1920 and 5 attacks and 4 deaths in July 1921.

chance of entry Most of the maths are on the bank or in the neighbourhood of the river, and few, if any, have a water supply connection None provide latrine accommodation

The lodging houses vary in structure from the three storied, terrace roofed, stone walled building to others of a less pretentious nature The temple is surrounded by such houses built back to back, and with narrow passages between adjacent groups of buildings The most undesirable feature of these houses is the entrance through what is called the 'dhaba' The main door and the latrine are side by side and in close proximity are the water tap or vessels for storing water and bathing place, then comes the stall for cattle The dhaba is a small room about 10 feet by 8 feet A loft or pot dhaba is placed at the height of about 6 feet and here is the kitchen The dhaba and pot dhaba are as a rule, attachments to the main house The passage between houses, and their removal may help in solving the most difficult problem in Pandharpur

Within recent years efforts have been made to ensure regular cleansing of these lodging houses, improve the light and ventilation, and fix the minimum superficial area for each pilgrim, and these efforts have met with an appreciable amount of success

Water supply—The severe and evidently water borne epidemics of cholera in 1904 and 1907 led to the introduction of the present water supply pumping from wells some distance above the town in the bed of the river

There are 26 wells in the town, the majority of which are closed in fair times

The pilgrims therefore drink tap water, well water, and tank water, although an effort is made to guard the tank

During the prevalence of cholera, the main reservoir is permanganated regularly An infiltration trench has recently been constructed and the provision of a larger pumping plant is under consideration

Drainage—The surface drainage of the town has been carried out piecemeal since 1884, up to 1905 the engineer had no very definite plan on which to work, and the drains appear to have had 8 distinct outlets, 6 into the river in the vicinity of the bathing ghats, and 2 into a sluggish nullah running between the town and Gopalpur The Sanitary Board in 1905 recommended 2 intercepting sewers, one to take the outlets into the river, and the other to replace the nullah The former has been constructed, but there is a complaint about the position of the outlet in the river just above the Hindu cremation ground

Conservancy—Ample land is available in the neighbourhood, and trench latrines are provided in different directions of the town But the soil is black cotton and therefore friable

Trenches up to 4 feet in depth are dug They shelve outwards and the floor of the trench is wider than it is on ground level Squatting platforms are built on a series of horizontal poles separated from each other by a space of about 3 feet On these poles are nailed a pair of strong wooden planks, smoothed and tarred. The interval between the planks is 7 inches Foot rests are provided at intervals of every

Pilgrims are drawn to Pandharpur from all over the Deccan and the southern Maratha country, the Nizam's Dominions, Khandesh, and the Berars.

In this way the zone of influence of Vithoba's temple at Pandharpur is more restricted than the influence of the Godavari which spreads over the whole continent of India, but the number of pilgrims who visit Pandharpur annually is considerably larger than those visiting Nasik and Trimbak, and the difficulty of 'sanitating' for them is proportionately greater at Pandharpur.

Temple and its Surroundings.—Between 1865 and 1873 the various sanitary reports pointed to the interference with the passage of pilgrims and with ventilation resulting from the construction of the temple. Government in 1871 ordered that the closure of the temple between 11 p.m. and 3 a.m. for the purpose of purifying the air should be strictly enforced. The alterations in design for the better control of pilgrims and for more efficient ventilation were finally disposed of by resolutions published in 1875, 1876 and 1877. The improvements thus effected consisted in the provision of new doors, the widening and heightening of other doors, the admission of fresh air, and extraction of foul air by inlet and outlet tubes and the opening of holes in the roof of the Chavakhamb (a ceiling supported by four pillars). The holes in the roof were widened, and a fan fixed for the circulation of air in 1908.

These 3 tubes are fixed about 6 feet above the floor level and lead outside through the walls of the 'Gahbara' (dome). Ordinarily no other means of facilitating ventilation are adopted, but during fairs a thermantidote is attached to one of these tubes to exhaust the foul air. The other two tubes are provided simply with Kepi cowls and balance vanes which seldom work. The thermantidote is worked by manual labour and is more often neglected than not. The Assistant Director of Public Health has put up a proposal to join all the three tubes to a larger pipe attached to an exhaust fan worked by a small oil or gas engine. This proposal is engaging the attention of the authorities.

Improving the lighting of the Idol Chamber in order to make the Deity more visible by providing electric lights or Kitson lamps, and widening the streets in the neighbourhood to improve the approaches of the temple are other items which demand attention.

Housing.—This is a problem more acute in Pandharpur than at Nasik. Pilgrims find accommodation in municipal dharamshalas, maths, and lodging-houses—licensed and unlicensed.

There are 11 dharamshalas, but 3 situated at Gopalpur are in a bad state of repair and are seldom if ever used. The remaining dharamshalas afford decent shelter for about 4,000 pilgrims: they are used, however, only by those who fail to obtain accommodation in houses nearer the temple.

The maths are intended for pilgrims of a certain caste or creed, or those coming from certain districts, and are used by pilgrims accompanying palkees. The usual style of building is an open verandah surrounding a quadrangle in which trees are planted; as a rule there are a few rooms to which light and air have little

Evidence of Dissemination of Diseases from Pandharpur The diseases which are chiefly responsible for the morbidity and mortality of Pandharpur are cholera and diarrhœa (including dysentery) The cholera history for the past 49 years shows 15 blank years and 2 terribly severe epidemics one in 1904 and the other in 1907 Between 1867 and 1873 the date of introduction of the tank water supply there were four blank years and an average annual cholera mortality (exclusive of blank years) of 73 Between 1874 and 1883 there were three blank years and an average cholera mortality of 154 Between 1884 and 1893 there was one blank year and an average mortality of 144 Between 1893 and 1903 there were four blank years and an average mortality of 219 During this period dipping cisterns were introduced Between 1904 and 1911 there were three blank years and an average mortality of 520 Between 1912 (the date of introduction of the present water works) and 1915 there has been one blank year (1915) and an average mortality of 125

Between 1916 and 1926 there were four blank years and an average mortality of 156

During the current year when a severe epidemic of cholera was prevailing in the southern Maratha country and in the neighbouring Nizam s Dominions it became a matter of serious concern whether to permit or prohibit the Ashadhi festival last July at Pandharpur Prohibition of religious festivals in India can never be enforced completely since pilgrims fired by religious enthusiasm pay little attention to such prohibition and so it was decided to strengthen the safeguards take extra precautions and allow the festival this year The pilgrimage lasted for 5 days in July and 133 500 pilgrims visited Pandharpur during this time There were 266 attacks and 163 deaths from cholera among these Out of these only 36 attacks and 14 deaths occurred among the 60 000 followers of the palkees who were sanitated for from start to finish and 230 attacks and 130 deaths among the 70 000 pilgrims or so who travelled unattended and more or less unwatched In Pandharpur town itself with a population of 25 210 invaded as it was by about 150 000 pilgrims from all parts of the country some of which were badly infected with cholera there were only 58 attacks and 30 deaths and the outbreak in the town lasted only 19 days The leading journal of the Bombay Presidency (*The Times of India*) has described the management of this festival at Pandharpur as a sanitary triumph but what I feel even more grateful for than these results is the fact that cholera spread to such few places through this festival Most careful enquiries were instituted and it was revealed that only 41 places in the Presidency got infected through returning pilgrims and there were only 201 attacks and 80 deaths at these

I attribute this limited spread of the disease to the system of prompt notification to the local authorities concerned of all cases of cholera which occurred at Pandharpur a system which helped the authorities at the other end to keep the contacts under observation when they returned

3 feet. They are not essential but are of course useful. For privacy a tarred matting partition is erected between seats and the whole space is enclosed to screen it from the outside public.

Sweepers are in constant attendance and cover the ordure with cut grass soaked in crude oil and dry earth at frequent intervals. When the ordure reaches within 1 foot of ground level, the squatting platforms are removed and the trench is filled with earth and the earth is well stamped down.

Rubbish is burnt in incinerators, and a liberal use of Pesterine ensures safety from flies.

Means of Communication.—Good metalled roads lead to Pandharpur from all parts of the Presidency. The road traffic to Pandharpur is of especial importance to the public health in June and July for at that time 19 palkees attended by carriers start from various religious centres and converge on Pandharpur.

Passengers are brought by the Great Indian Peninsula broad gauge railway to Kurduwadi, and are carried thence to Pandharpur by the 2 feet 6 inches gauge Barsi light railway.

Public Health Arrangements.—There is a permanent dispensary under an assistant surgeon.

The subsidiary arrangements for fairs may be described under two heads:—

(*a*) those intended to protect Pandharpur from infection by incoming pilgrims;

(*b*) those for the protection of outlying districts by returning pilgrims.

(*a*) *Protection of Pandharpur.*—(1) Medical inspection of all railway passengers at Kurduwadi and Pandharpur stations.

(2) Despatch of a sub-assistant surgeon to meet the incoming Alandi palkee at Malsiras. Other sub-assistant surgeons are kept in readiness to meet other palkees in the event of cholera being reported.

(3) Inspection of all road passengers at different nakas.

(4) Establishment of an infectious diseases hospital at Kurduwadi. This is maintained by the Pandharpur municipality and was opened in 1908. A temporary staff is appointed for the big fairs.

(5) The opening of a cholera hospital in Pandharpur.

(6) The provision of dolies and bearers to carry patients to the hospital. The town is divided into 9 wards, and a dolie and bearers stationed in each under an inspector whose duty it is to discover cases in the area under his charge.

(*b*) *Protection of Outlying Districts.*—(1) Inspection of all outgoing railway passengers at Pandharpur and Kurduwadi.

(2) Road inspection at the 5 nakas.

(3) Detailment of sub-assistant surgeons to accompany the principal palkees for 6 marches on the return journey.

For these duties about 35 sub-assistant surgeons are employed for the [illegible] fair and a smaller number at the Kartiki fair.

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RECENT STATISTICAL REPORTS OF HEALTH OF THE JAPAN NAVY

BY

CAPT SURGEON S TAKASUGI, I J N

I HAVE the honour to read before you the summary of the statistical reports of health of the Japanese Navy for the recent years

The tables and descriptions in the annual report of the Medical Department of the Japanese Navy are dealt with in extremely simplified form

The Medical Bureau has endeavoured, as in the past, to improve the hygienic and sanitary conditions of all occupations of the Navy by studying many problems of clinical and preventive medicine It is naturally believed that intimate co operations with other medical societies and institutes are very important for the solution of these questions

GENERAL MORBIDITY AND MORTALITY FOR ENLISTED MEN OF THE JAPANESE NAVY

In 1926 the admission rate from all causes was 704 44 per 1,000 which gives a decrease of 98 16, as compared with the average of twenty years (1900—1920) The downward trend of admission rate from all causes of diseases appears rather slight but continuing

The rate of invalidings was 11 74 per 1,000 of strength, a decrease of 3 70, as compared with the average of twenty years (1900—1920)

The death rate was 3 68 per 1,000 of strength, a decrease of 2 46, as compared with the twenty years' average

Decrease of the admission rate, year after year, will continue to register progress in the art of clinical and preventive medicine applied in the Navy

TABLE I

Showing the Number of Cases of Disease and Injury entered on the Sick List and the Number of Invalidings and Deaths, giving the Rate per 1,000 of Strength

Year	Cases	Invalidings out of Service	Dead
Average (1900 1920)	802 60	15 41	6 13
„ 1921	710 67	15 10	4 37
„ 1922	586 71	14 35	8 67
„ 1923	563 17	16 03	5 20
„ 1924	535 19	14 65	5 92
„ 1925	494 98	13 56	4 53
„ 1926	704 44	11 74	3 67

Before I conclude I must say a few words about 'palkees' and the way they are controlled. A 'palkee' may be described as a 'palanquin' carrying the ... prints of a vassal deity and visiting the suzerain god.

Such palkees visit Pandharpur from 19 different places for the Ashadhi festival in July. Most come from different parts of Bombay Presidency and one comes all the way from the Berars in Central Provinces. The distance they traverse varies from 100 to 300 miles and as the idols are brought all the way by road, the danger of their disseminating disease all along the route has to be reckoned with. It is considered an act of merit among Hindus to follow a palkee, and I know of devotees who have visited Pandharpur with their palkees year after year for 40 years without missing a single occasion. When it is remembered that each visit entails a journey on foot of any thing from 200 to 600 miles, such devotion cannot but attract one's admiration. But what the matter of fact sanitarian is concerned with is not the devotion of the pilgrims, but the difficulties which beset the sanitary management of these palkees. The numbers attending these palkees vary considerably and a palkee starting with 50 followers may end up near Pandharpur with 15,000 devotees. The arrangements for safeguarding these ... and preventing disease spreading through them are, briefly, as follows :—

(1) All the followers who collect at the starting point are put through a medical ...ination, definite routes and a programme of progress of each palkee are fixed in advance, and at each stopping place the followers are subjected to a similar ...ation. If a case of any epidemic disease is detected, the patient and ... are segregated and the local authorities of the place from which he came ... of the occurrence by wire.

... Sources of drinking water-supply all along the routes are sterilized both ... is due and after it passes a place.

... arrangements are made for conserving camping grounds.

... ...stuffs all along the way are regularly inspected.

... ...l or a sanitary officer is in attendance and he keeps the Assistant

(4) ... Health of the Division informed of the health conditions of the ...is maintained ... progresses.

...temporar... ...ff is ... ...heme depends on the good-will and co-operation of the

(5) ... of each palkee and the results we achieve through

(6) ... I have just said about only 36 cases

The to... ...Pandharpur from cholera among the

under an... ...0 attacks and 149 deaths among

(b) P... ...heir own.

...assengers a... we may have achieved in

(2) Road ... festivals is due to the

(3) Detail ... of a public health

... hes on ... ...uch with the

...these du...

and a

included common colds, acute laryngitis, catarrhal angina and some mild form of bronchitis

TABLE III

Showing the Detailed Statement of Diseases and Injuries in 1926

Diseases caused by Infection and of General Type

Diseases	Cases	Invalided out of Service	Died	Rate per 1 000 of Strength
Small pox	2	0	0	0 03
Measles	8	0	0	0 12
Scarlet Fever	5	0	0	0 07
Diphtheria	4	0	1	0 06
Typhoid Fever	31	0	1	0 45
Typhoid Carrier	1	0	0	0 01
Paratyphoid A	2	0	0	0 03
Paratyphoid A Carrier	3	0	0	0 04
Paratyphoid B	43	0	1	0 63
Paratyphoid B, Carrier	97	0	0	1 41
Cholera	1	0	0	0 01
Cholera Carrier	4	0	0	0 06
Dysentery, Bacillary	175	0	3	2 55
Dysentery Carrier	92	0	0	1 34
Dysentery, Amœbic	19	0	2	0 28
Malaria	53	0	0	0 77
Cerebrospinal Fever	1	0	1	0 01
Influenza	111	0	1	1 62
Mumps	27	0	0	0 39
Erysipelas	12	0	0	0 17
Pyogenic infection	2	0	2	0 03
Tetanus	1	0	1	0 01
Rheumatic Fever	147	0	0	2 14
Rheumatism, Chronic	41	9	0	0 60
Kakke	346	18	2	5 05
Leprosy	8	7	0	0 12
Tuberculosis of Lung	384	293	52	5 60
" Pleura	34	19	17	0 50
" Peritoneum	20	5	4	0 29
" Meninges	17	0	17	0 25
" Kidney, Bladder	4	1	0	0 06
" Gland	38	1	0	0 55
" Bone Joint	68	24	0	0 99
" Others	43	1	0	0 63
Weil's Disease	1	0	1	0 01
Leukæmia	1	0	2	0 01
Scorbutus Purpura	5	0	2	0 07
Diabetes	2	0	0	0 03
Uræmia	3	0	2	0 04
Poisoning of Gas	35	0	3	0 51
" Alcohol	5	0	2	0 07
" Others	6	0	0	0 09
Heat Exhaustion	23	0	1	0 34
Filariasis	17	0	0	0 25
Malignant Tumour	2	1	0	0 03
Other Diseases of Infection and of General Type	127	0	1	1 85
TOTALS	2 071	379	119	30 20

TABLE II.

Showing the Comparative Importance of the Several Classes, Japanese Navy Nomenclature of Diseases and Injuries, in causing Admissions to the Sick List.

Diseases or Injuries.	Admission Rate per 1,000 of Strength.						
	Average 1900—1920.	1921.	1922.	1923.	1924.	1925.	1926.
Diseases caused by Infection and of General Type.	61·95	75·14	68·49	35·80	35·69	28·88	30·20
Nervous and Mental Diseases	11·90	9·22	7·08	9·08	9·20	6·99	7·85
Diseases of Respiratory System.	74·17	74·20	63·14	60·34	59·93	52·09	58·10
Diseases of Circulatory System.	10·02	10·39	10·21	10·79	10·02	8·89	12·09
Diseases of the Digestive System.	193·57	230·60	165·88	175·38	166·04	160·63	267·87
Diseases of Urogenital System.	9·67	4·08	3·87	3·92	4·50	3·95	5·02
Venereal Diseases ..	155·90	91·45	89·60	98·18	83·04	82·38	94·74
Diseases of the Eye ..	27·62	14·52	11·77	12·31	11·24	11·06	19·07
Diseases of the Ear ..	10·60	8·41	7·50	7·57	6·56	5·53	8·59
Diseases of the Areolar Tissue and Skin.	95·68	79·13	65·49	56·25	53·33	52·83	80·53
Diseases of Organs of Locomotion.	11·46	7·94	6·06	6·31	5·18	4·19	6·18
Injuries	134·88	95·34	82·36	85·02	87·59	76·16	113·35
Other Injuries and Diseases	2·19	1·25	5·25	2·22	2·88	1·40	0·85
TOTALS ..	802·60	710·67	586·71	563·17	535·19	494·98	704·44

THE PRINCIPAL CAUSES OF ADMISSION TO THE SICK LIST IN THE JAPANESE NAVY.

The following tables indicate only the relative importance of several diseases and injuries during the recent years, with regard to frequency, occurrence and invaliding of the strength.

According to the numbers of admission in most years, acute pharyngitis, acute bronchitis, acute gastro-enteritis and the venereal diseases are the principal causes of admission to the sick list. Under the title of acute pharyngitis are

TABLE III—*contd.*

Diseases of Digestive System.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Diseases of Teeth, Gingivitis ..	313	0	0	4·56
Diseases of Dental, Jaws ..	18	0	0	0·26
Stomatitis	22	0	0	0·32
Acute Tonsilitis	1,395	0	1	20·34
Hypertrophy of Tonsils ..	9	0	0	0·13
Acute Pharyngitis	8,538	0	0	12·45
Diseases of Salivary Gland ..	40	0	0	0·58
Acute Gastritis	1,092	0	0	15·92
Chronic Gastritis	71	0	0	1·04
Dilatation of Stomach	1	0	0	0·01
Gastric Ulcer	8	1	2	0·12
Gastroneurosis	44	0	0	0·64
Acute Enteritis .. .	5,128	0	0	74·78
Chronic Enteritis ..	32	0	0	0·47
Hernia	58	0	0	0·85
Intestinal Obstruction . ..	7	1	4	0·10
Appendicitis, Typhlitis	639	0	0	9·32
Ankylostomiasis . ..	21	0	0	0·31
Ascaridiasis	73	0	0	1·06
Tæniasis	5	0	0	0·07
Catarrhal Jaundice . ..	242	0	0	3·53
Abscess of Liver . ..	3	0	2	0·04
Cholelithiasis . ..	11	0	0	0·16
Acute Peritonitis . ..	7	0	4	0·10
Fistula in Ano	141	0	0	2·06
Prolapsus of Rectum	15	0	0	0·22
Perityphlitis .. .	139	0	0	2·03
Other Diseases of Digestive System	297	0	1	4·33
TOTALS ..	18,369	2	11	267·87

Diseases of Genito-urinary System.

Acute Nephritis	78	1	2	1·14
Chronic Nephritis	20	5	3	0·29
Cystitis	39	0	0	0·57
Disease of Prostate	5	0	0	0·07
Disease of Urethra	13	1	0	0·19
Disease of Penis .. .	95	0	0	1·39
Disease of Spermatic Cord .	47	0	0	0·69
Testicle, Epididymis	19	0	0	0·28
Hydrocele	7	0	0	0·10
Other Diseases of Urogenital System	21	0	0	0·31
TOTALS ..	314	7	5	5·02

TABLE III—*contd.*

Nervous and Mental Diseases.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Diseases of Mind.—				
Psychosis, Maniac-depressive ..	5	5	0	0·07
Dementia Præcox	8	8	0	0·12
Dementia Paralytica ..	1	0	1	0·01
Other Psychoses	3	2	0	0·04
Epilepsy	19	8	1	0·28
Neurasthenia	214	16	0	0·12
Hysteria	6	3	0	0·09
Neurosis, Traumatic	5	1	0	0·07
Diseases of Brain and Meninges ..	20	2	3	0·29
Disease of Spinal Cord and its Membrane.	1	0	0	0·01
Paralysis of Peripheral Nerve ..	21	1	0	0·31
Neuralgia	197	6	0	2·87
Others	38	3	0	0·55
TOTALS ..	538	55	5	7·85

Diseases of Respiratory System.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Acute Rhinitis	47	0	0	0·69
Chronic Rhinitis	187	1	0	2·73
Other Diseases of Nose, Sinus ..	255	0	0	3·72
Acute Laryngitis	11	0	0	0·16
Chronic Laryngitis	1	0	0	0·01
Other Diseases of Throat and Bronchi	5	1	0	0·07
Acute Bronchitis	1,986	0	0	28·96
Chronic Bronchitis	217	30	2	3·16
Asthma	4	0	0	0·06
Catarrh of Apex	259	90	0	3·78
Pneumonia, Croupous	43	0	5	0·63
Pneumonia, Catarrhal	25	0	4	0·36
Distoma pulmonale	7	1	0	0·10
Pleurisy	882	142	19	12·84
Other Diseases of Respiratory System	55	0	5	0·80
TOTALS ..	3,984	265	35	58·10

Diseases of Circulatory System.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Pericarditis	3	1	0	0·04
Myocarditis	2	0	1	0·03
Valvular Disease	11	3	0	0·16
Cardiac Neurosis	18	0	0	0·26
Hæmorrhoids	437	0	0	6·37
Diseases of Lymphatic System ..	324	0	0	4·72
Other Diseases of Circulatory System	34	0	8	0·50
TOTALS ..	829	4	9	12·09

TABLE III—*contd*

Diseases of Digestive System

Diseases	Cases	Invalided out of Service	Died	Rate per 1,000 of Strength
Diseases of Teeth, Gingivitis	313	0	0	4 56
Diseases of Dental Jaws	18	0	0	0 26
Stomatitis	22	0	0	0 32
Acute Tonsilitis	1,395	0	1	20 34
Hypertrophy of Tonsils	9	0	0	0 13
Acute Pharyngitis	8 638	0	0	12 45
Diseases of Salivary Gland	40	0	0	0 58
Acute Gastritis	1,092	0	0	15 92
Chronic Gastritis	71	0	0	1 04
Dilatation of Stomach	1	0	0	0 01
Gastric Ulcer	8	1	2	0 12
Gastroneurosis	44	0	0	0 64
Acute Enteritis	5 128	0	0	74 78
Chronic Enteritis	32	0	0	0 47
Hernia	58	0	0	0 85
Intestinal Obstruction	7	1	4	0 10
Appendicitis, Typhlitis	639	0	0	9 32
Ankylostomiasis	21	0	0	0 31
Ascariasis	73	0	0	1 06
Tæniasis	5	0	0	0 07
Catarrhal Jaundice	242	0	0	3 53
Abscess of Liver	3	0	2	0 04
Cholelithiasis	11	0	0	0 16
Acute Peritonitis	7	0	4	0 10
Fistula in Ano	141	0	0	2 06
Prolapsus of Rectum	15	0	0	0 22
Perityphlitis	139	0	0	2 03
Other Diseases of Digestive System	297	0	1	4 33
TOTALS	18 369	2	14	267 87

Diseases of Genito urinary System

Acute Nephritis	78	1	2	1 14
Chronic Nephritis	20	5	3	0 29
Cystitis	39	0	0	0 57
Disease of Prostate	5	0	0	0 07
Disease of Urethra	13	1	0	0 19
Disease of Penis	95	0	0	1 39
Disease of Spermatic Cord	47	0	0	0 69
Testicle Epididymis	19	0	0	0 28
Hydrocele	7	0	0	0 10
Other Diseases of Urogenital System	21	0	0	0 31
TOTALS	344	7	5	5 02

TABLE III—*contd.*

Nervous and Mental Diseases.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Diseases of Mind.—				
Psychosis, Maniac-depressive ..	5	5	0	0·07
Dementia Præcox	8	8	0	0·12
Dementia Paralytica ..	1	0	1	0·01
Other Psychoses	3	2	0	0·04
Epilepsy	19	8	1	0·28
Neurasthenia	214	16	0	0·12
Hysteria	6	3	0	0·09
Neurosis, Traumatic	5	1	0	0·07
Diseases of Brain and Meninges ..	20	2	3	0·29
Disease of Spinal Cord and its Membrane.	1	0	0	0·01
Paralysis of Peripheral Nerve ..	21	1	0	0·31
Neuralgia	197	6	0	2·87
Others	38	3	0	0·55
TOTALS ..	538	55	5	7·85

Diseases of Respiratory System.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Acute Rhinitis	47	0	0	0·69
Chronic Rhinitis	187	1	0	2·73
Other Diseases of Nose, Sinus ..	255	0	0	3·72
Acute Laryngitis	11	0	0	0·16
Chronic Laryngitis	1	0	0	0·01
Other Diseases of Throat and Bronchi	5	1	0	0·07
Acute Bronchitis	1,986	0	0	28·96
Chronic Bronchitis	217	30	2	3·16
Asthma	4	0	0	0·06
Catarrh of Apex	259	90	0	3·78
Pneumonia, Croupous	43	0	5	0·63
Pneumonia, Catarrhal	25	0	4	0·36
Distoma pulmonale	7	1	0	0·10
Pleurisy	882	142	19	12·84
Other Diseases of Respiratory System	55	0	5	0·80
TOTALS ..	3,984	265	35	58·10

Diseases of Circulatory System.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Pericarditis	3	1	0	0·04
Myocarditis	2	0	1	0·03
Valvular Disease	11	3	0	0·16
Cardiac Neurosis	18	0	0	0·26
Hæmorrhoids	437	0	0	6·37
Diseases of Lymphatic System ..	324	0	0	4·72
Other Diseases of Circulatory System	34	0	8	0·50
TOTALS ..	829	4	9	12·09

TABLE III—*contd*

Diseases of Digestive System

Diseases	Cases	Invalided out of Service	Died	Rate per 1,000 of Strength
Diseases of Teeth, Gingivitis	313	0	0	4 56
Diseases of Dental Jaws	18	0	0	0 26
Stomatitis	22	0	0	0 32
Acute Tonsilitis	1,395	0	1	20 34
Hypertrophy of Tonsils	9	0	0	0 13
Acute Pharyngitis	8 538	0	0	12 45
Diseases of Salivary Gland	40	0	0	0 58
Acute Gastritis	1,092	0	0	15 92
Chronic Gastritis	71	0	0	1 04
Dilatation of Stomach	1	0	0	0 01
Gastric Ulcer	8	1	2	0 12
Gastroneurosis	44	0	0	0 64
Acute Enteritis	5 128	0	0	74 78
Chronic Enteritis	32	0	0	0 47
Hernia	58	0	0	0 85
Intestinal Obstruction	7	1	4	0 10
Appendicitis, Typhlitis	639	0	0	9 32
Ankylostomiasis	21	0	0	0 31
Ascariasis	73	0	0	1 06
Tæniasis	5	0	0	0 07
Catarrhal Jaundice	242	0	0	3 53
Abscess of Liver	3	0	2	0 04
Cholelithiasis	11	0	0	0 16
Acute Peritonitis	7	0	4	0 10
Fistula in Ano	141	0	0	2 06
Prolapsus of Rectum	15	0	0	0 22
Perityphlitis	139	0	0	2 03
Other Diseases of Digestive System	297	0	1	4 33
TOTALS	18 309	2	14	267 87

Diseases of Genito urinary System

Diseases	Cases	Invalided out of Service	Died	Rate per 1,000 of Strength
Acute Nephritis	78	1	2	1 14
Chronic Nephritis	20	5	3	0·29
Cystitis	39	0	0	0·57
Disease of Prostate	5	0	0	0·07
Disease of Urethra	13	1	0	0·19
Disease of Penis	95	0	0	1 39
Disease of Spermatic Cord	47	0	0	0·69
Testicle, Epididymis	19	0	0	0·28
Hydrocele	7	0	0	0·10
Other Diseases of Urogenital System	21	0	0	0·31
TOTALS	344	7	5	5·02

TABLE III—*contd.*

Nervous and Mental Diseases.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Diseases of Mind.—				
Psychosis, Maniac-depressive ..	5	5	0	0·07
Dementia Præcox	8	8	0	0·12
Dementia Paralytica ..	1	0	1	0·01
Other Psychoses	3	2	0	0·04
Epilepsy	19	8	1	0·28
Neurasthenia	214	16	0	0·12
Hysteria	6	3	0	0·09
Neurosis, Traumatic	5	1	0	0·07
Diseases of Brain and Meninges ..	20	2	3	0·29
Disease of Spinal Cord and its Membrane.	1	0	0	0·01
Paralysis of Peripheral Nerve ..	21	1	0	0·31
Neuralgia	197	6	0	2·87
Others	38	3	0	0·55
TOTALS ..	538	55	5	7·85

Diseases of Respiratory System.

Acute Rhinitis	47	0	0	0·69
Chronic Rhinitis	187	1	0	2·73
Other Diseases of Nose, Sinus ..	255	0	0	3·72
Acute Laryngitis	11	0	0	0·16
Chronic Laryngitis	1	0	0	0·01
Other Diseases of Throat and Bronchi	5	1	0	0·07
Acute Bronchitis	1,986	0	0	28·96
Chronic Bronchitis	217	30	2	3·16
Asthma	4	0	0	0·06
Catarrh of Apex	259	90	0	3·78
Pneumonia, Croupous	43	0	5	0·63
Pneumonia, Catarrhal	25	0	4	0·36
Distoma pulmonale	7	1	0	0·10
Pleurisy	882	142	19	12·84
Other Diseases of Respiratory System	55	0	5	0·80
TOTALS ..	3,984	265	35	58·10

Diseases of Circulatory System.

Pericarditis	3	1	0	0·04
Myocarditis	2	0	1	0·03
Valvular Disease	11	3	0	0·16
Cardiac Neurosis	18	0	0	0·26
Hæmorrhoids	437	0	0	6·37
Diseases of Lymphatic System ..	324	0	0	4·72
Other Diseases of Circulatory System	34	0	8	0·50
TOTALS ..	829	4	9	12·09

TABLE III—*contd*

Diseases of Skin and Areolar Tissue

Diseases	Cases	Invalided out of Service	Died	Rate per 1 000 of Strength
Scabies	127	0	0	1 85
Herpes	107	0	0	1 56
Other Parasitic Skin Disease	11	0	0	0 16
Eczema	216	0	0	3 15
Hives	94	0	0	1 37
Alopecia Areata	29	0	0	0 42
Pompholyx	147	0	0	2 14
Bites of Insects	15	0	0	0 22
Phlegmon	1 275	0	0	18 59
Furuncle Carbuncle	1 963	0	0	28 63
Panaris	328	1	0	4 78
Benign Tumour	165	0	0	2 41
Other Skin Diseases	1 045	0	0	15 24
TOTALS	5 522	1	0	80 53

Diseases of Organs of Locomotion

Disease of Bone, Joints	52	0	0	0 76
Arthritis	80	3	0	1 17
Muscle Rheumatism	145	1	0	2 11
Suppurative Myositis	28	0	0	0 41
Affection of Bursa	24	0	0	0 35
Disease of Tendon and Synovial Sheaths	54	0	0	0 79
Other Diseases of Organs of Locomotion	41	0	0	0 60
TOTALS	494	4	0	6 18

Injuries

Incised Wound	343	0	0	5 00
Contusion	[illegible] 115	1	0	31 28
Contused and Lacerated Wound	2 945	3	0	4[illegible] 93
Amputated Wound	73	17	0	1 06
Punctured Wound	84	0	0	1 22
Bullet Wound	3	1	1	0 04
Bite Wound	12	0	0	0 17
Shoe Sore	297	0	0	4 33
Wound from Explosion	5	0	0	0 07
Scalds and Burns	345	1	4	5 03
Frost bite	156	0	0	2 28
Concussion of Brain and Spinal Cord	13	0	0	0 19
Injury of Eye	102	6	0	1 49
Carried over	6,523	29	5	

TABLE III—*contd.*

Venereal Diseases.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Gonorrhœa, Acute Urethritis ..	1,783	0	0	26·00
,, Chronic Urethritis ..	552	0	0	8·05
,, Disease of Epididymis ..	326	0	0	4·75
,, Conjunctivitis ..	8	0	0	0·12
,, Arthritis	32	1	0	0·47
,, Others	7	0	0	0·10
Soft Chancroid	1,513	0	0	22·06
Bubo	816	0	0	11·90
Syphilis, Initial Duration ..	591	0	0	8·62
,, Secondary Stage ..	857	0	0	12·50
,, Tertiary Stage ..	12	2	0	0·17
TOTALS ..	6,497	3	0	94·74

Diseases of the Eye.

Trachoma	554	1	0	8·08
Other Diseases of Conjunctiva ..	512	0	0	7·47
Disease of Cornea	79	4	0	1·15
Disease of Sclera	2	0	0	0·03
Disease of Iris, Ciliary Body ..	8	0	0	0·12
Disease of Retina	1	1	0	0·10
Disease of Optic Nerve ..	11	7	0	0·16
Disease of Crystaline Lens ..	7	3	0	0·10
Disease of Vitreous Body ..	7	1	0	0·10
Disease of Eyelid	99	0	0	1·44
Disease of Lachrymal Apparatus ..	3	0	0	0·04
Disease of Eye Muscles ..	1	0	0	0·01
Anomalies of Refraction and Accommodation.	4	0	0	0·06
Spontaneous Hemianopia ..	4	0	0	0·06
Other Diseases of Eye	10	0	0	0·15
TOTALS ..	1,308	17	0	19·07

Diseases of the Ear.

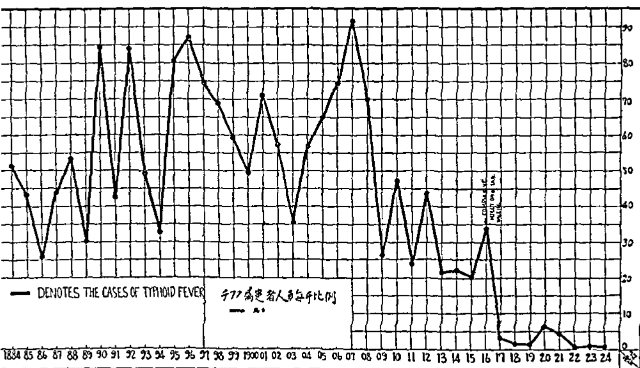
Disease of Auditory Canal and Meatus	182	0	0	2·65
Disease of Tympanic Membrane ..	58	0	0	0·84
Disease of Tympanic Cavity ..	324	0	0	4·72
Disease of Eustachian Tube ..	4	0	0	0·06
Disease of Internal Ear ..	10	1	0	0·15
Other Diseases of Ear	11	1	0	0·16
TOTALS ..	589	2	0	8·59

Typhoid and Paratyphoid Fever

According to the annual health report of the Japanese Home Department the number of typhoid and paratyphoid cases is increasing every year, but the case is almost absent for these ten years among the enlisted personnels of the Japanese Navy, numbering one thousandth of the whole population of Japan Herewith,

Chart I

Showing the Number of Cases of Typhoid Fever per 1,000 enlisted Men in the Japanese Navy from 1884 to 1924



1916 it was enacted to make every year a preventive injection of T A B vaccine for the whole of the enlisted men in the Navy, and as a consequence the prevalence of T A B in our Navy was promptly eradicated

I am inviting your kind attention to the valuable lesson which we learned from our experience in the anti typhoid campaign of our Navy, because I think it might give you some information for your preventive scheme of typhoid group In the past, the Japanese Navy was greatly affected by the annual epidemic of typhoid group and we were unable to put it under control by our drastic measures, such as the diagnosis of suspicious patients by means of blood culture in bile medium,

TABLE III—*concld.*

Injuries—concld.

Diseases.	Cases.	Invalided out of Service.	Died.	Rate per 1,000 of Strength.
Brought forward ..	6,523	29	5	
Concussion of Labyrinth ..	4	0	0	0·06
Injury of Ear Drum	93	0	0	1·36
Injury of Teeth	21	0	0	0·31
Injury of Viscera	14	1	1	0·06
Fracture of Upper Arm ..	7	1	0	0·10
,, Forearm	49	4	0	0·71
,, Hand	118	11	0	1·72
,, Femur	7	3	0	0·10
,, Patella	4	0	0	0·06
Fracture of Leg	28	2	0	0·41
,, Foot	56	1	0	0·82
,, Skull	31	2	17	0·45
,, Clavicle	50	0	0	0·73
,, Scapula	5	0	0	0·07
,, Rib	12	0	0	0·17
,, Vertebra	2	1	0	0·03
,, Pelvis	3	0	0	0·04
Dislocation of Shoulder	34	0	0	0·50
,, Elbow	26	0	0	0·38
,, Wrist	7	0	0	0·10
,, Finger	12	0	0	0·17
,, Foot	2	1	0	0·03
,, Jaw	1	0	0	0·01
,, Other Joint ..	7	1	2	0·10
Torsion of Wrist	74	0	0	1·08
,, Finger	31	0	0	0·45
,, Ankle	304	2	0	4·43
,, Other Joint	142	2	0	2·07
Other Injuries	99	1	1	1·44
Traumatic Asthenia	17	1	0	0·25
TOTALS ..	7,773	66	26	113·35

Other Diseases and Injuries.

Drowning	16	0	10	0·23
Divers Disease	6	0	1	0·09
Electric Shock	4	0	3	0·06
Self-inflicted Wound	9	0	2	0·13
Suicide from Incised Wound ..	5	0	5	0·07
,, Throwing on the Line ..	3	0	3	0·04
,, Drowning	4	0	4	0·06
,, Hanging	7	0	7	0·10
,, Others	4	0	4	0·06
TOTALS ..	58	0	39	0·85
GRAND TOTALS ..	48,306	805	252	704·44

disinfection of the ship had been performed it was always the case that a sporadic form of epidemic occurred with a short interval

We were almost at our wit's end as far as the typhoid control was concerned Thereupon the typhoid vaccination was inaugurated in 1906 and was first applied to the whole crew of the 'Iwate' who were inoculated with the mono vaccine of typhoid The result being very satisfactory, the vaccination was applied to the crews of the 'Kasuga' the 'Fuji,' the 'Asama,' the 'Tokiwa' and the 'Mikasa' on board which continuous cases of typhoid had been reported in the same year In 1908 1909 and 1911 vaccination was performed on board the 'Iki' the 'Iwami' and the 'Ikoma' respectively Typhoid was completely controlled aboard these ships There occurred an explosive epidemic of paratyphoid A aboard the Kasuga,' the 'Tokiwa' the 'Fuji' and the 'Iwate in 1907 The mono vaccination of paratyphoid A was tried with very satisfactory results Furthermore the mono vaccination of paratyphoid B found its application in the epidemic of the disease in 1908 and 1910 aboard the 'Nisshin,' the 'Suwa' the 'Iwami' and the 'Hizen'

Although the mono vaccination of any type of typhoid group is effective as above stated it is very troublesome to give three different mono vaccinations on every person Dr Kabeshima of our Navy devised the triple vaccination of typhoid paratyphoid A and paratyphoid B to meet the said inconvenience In the experimental animals treated with the triple vaccine, the simultaneous production of immunity against all of typhoid group was observed There was no difference between the mono vaccination and the mixed vaccination as far as amount of defensive factor contained in the immune serum was concerned

After the preliminary investigation of the result of the mixed vaccination on human body, it was applied to the crew of the 'Katori' in 1911 Having obtained satisfactory result the Minister of Marine issued the following order on the 15th of May 1916

All enlisted personnels hereafter, should be inoculated with the triple vaccine of typhoid, paratyphoid A and paratyphoid B within one month after their enlistment and they are enforced to receive the inoculation once every fiscal year

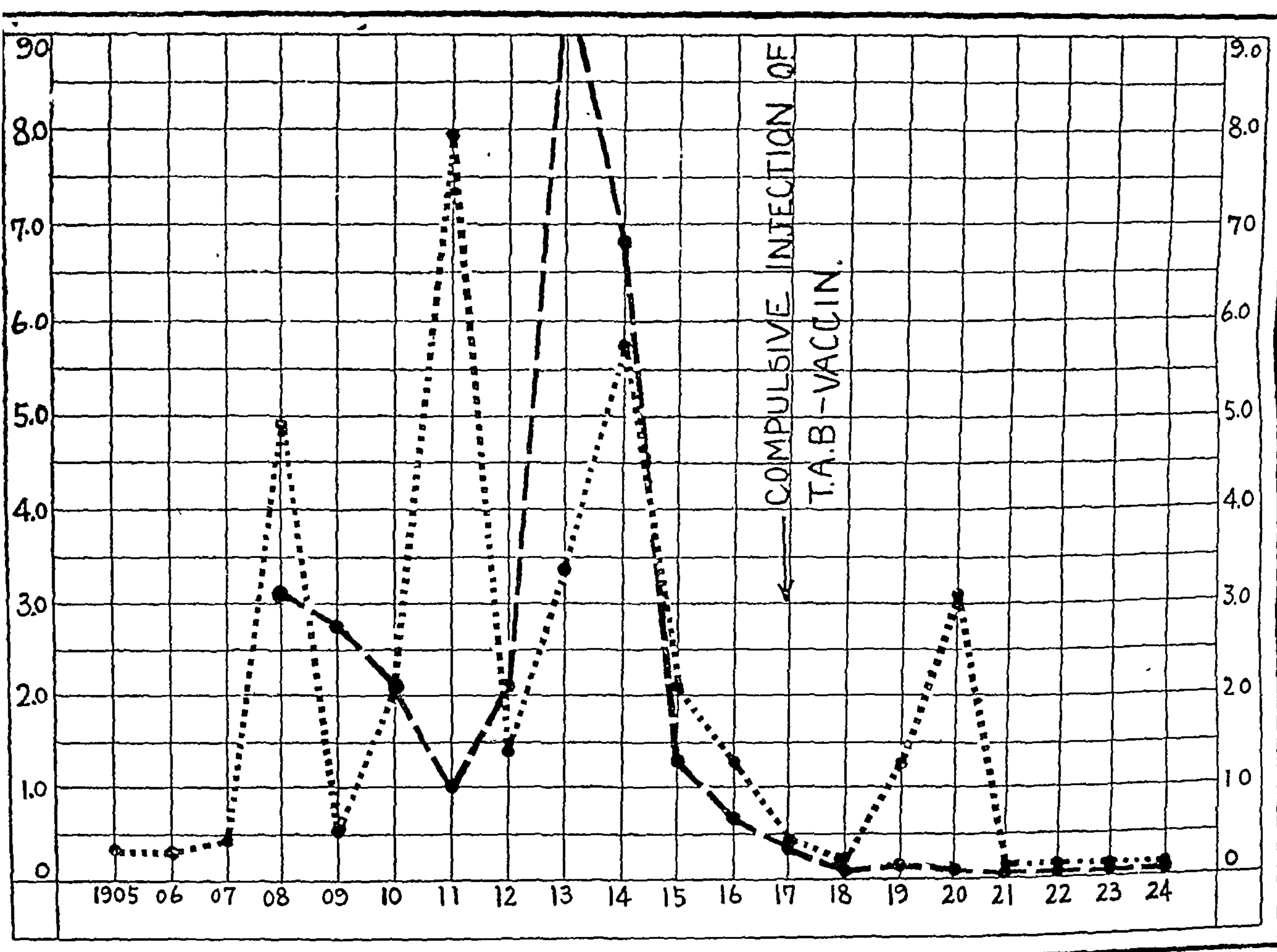
The preventive vaccination which had been limited to a certain part of our Navy was brought into general circulation since 1916 Our triple vaccine is prepared by heating the bacteria suspension in normal saline solution for one hour at the temperature of 55°C for typhoid and paratyphoid A, and at 58°C for paratyphoid B The prepared vaccine contains in its 1 c c each 1 mg of typhoid, paratyphoid A and B The reaction due to the injection of the mixed vaccine was slight

By general introduction of the mixed vaccination, we controlled cases of typhoid group among our enlisted personnels and we are at present as safe from the typhoid epidemic among the civilians as from a fire raging beyond a river

the immediate isolation of the patient, the disinfection of the contaminated objects and the detection of typhoid carriers among non-patients.

CHART II.

Showing the Number of Cases of Paratyphoid Fever (A and B) per 1,000 *enlisted Men in the Japanese Navy from* 1905 *to* 1924.



---- DENOTES THE CASES OF PARATYPHOID FEVER A.

.... DENOTES THE CASES OF PARATYPHOID FEVER B.

---- A型パラチフス

.... B型パラチフス

The cases of paratyphoid fever B showed a slight increase in 1919-20 which however were limited to only newly enlisted men who had not been previously injected with T.A.B.-vaccine.

Although the epidemic of typhoid was seemingly suspended after the patient had been diagnosed at the premature stage and the carriers had been detected by the examination of the entire crew aboard the contaminated ship while the

TABLE VI

Showing the Number of Cases and Deaths from Paratyphoid Fever B

Year	Cases		Deaths	
	Number	Rate per 1 000 of Strength	Number	Rate per 1,000 of Cases
1916	47	1 34		
1917	12	0 26		
1918	11	0 19		
1919	77	1 22		
1920	190	0 04		
1921	10	0 14		
1922	22	0 32		
1923	1	0 02		
1924	2	0 03		
1925	1	0 02		
1926	43	0 63	1	23 26

KAKKE

(Beri Beri)

The Medical Bureau of the Japanese Navy was established in 1872 At the time no medical officer in the Japanese Navy had the slightest idea of doing anything in prevention of kakke The medical records from 1872 to 1877 were only limited to the description on the results of certain treatments in hospitals The records between 1878 and 1883 were occasionally found with some worthy facts of hygienic affairs

The number of kakke patients from 1877 to 1883 was so large that it amounted to three fourths of the total number of patients, and a considerable number of sailors were lost from the death by kakke, so that the personnel of the Navy was very much depleted at times

In 1884, general aspect of the health condition in the Navy showed better records, as the number of sick cases markedly decreased, and the cases of kakke were only 5 93 per 1,000 men There was no death among the kakke patients

Since 1885, the condition was very much improved and the number of kakke patients was always less than 5 per 1,000 men even under the unfavourable conditions as during the Chino Japanese War, Russo Japanese War or the World War

TABLE IV.

Showing the Number of Cases and Deaths from Typhoid Fever.

Year.		Cases.		Deaths.	
		Number.	Rate per 1,000 of Strength.	Number.	Rate per 1,000 of Cases.
1916	..	185	3·30	38	171·17
1917	..	18	0·31	5	263·16
1918	..	11	0·19	3	230·77
1919	..	10	0·16	1	90·91
1920	..	39	0·62	4	102·56
1921	..	31	0·43	4	105·26
1922	..	23	0·33	10	344·83
1923	..	33	0·51	6	171·43
1924	..	39	0·60	10	227·27
1925	..	19	0·20	5	263·16
1926	..	31	0·45	1	30·30

TABLE V.

Showing the Number of Cases and Deaths from Paratyphoid Fever A.

Year.		Cases.		Deaths.	
		Number.	Rate per 1,000 of Strength.	Number.	Rate per 1,000 of Cases.
1916	..	36	0·66	..	..
1917	..	18	0·31	..	..
1918	..	3	0·05	..	..
1919	..	4	0·06	..	..
1920	..	1	0·02	..	..
1921	..	4	0·06	1	200·00
1922	..	4	0·06	..	..
1923	..	4	0·06	2	400·00
1924	..	1	0·02	..	..
1925	..	3	0·05	..	..
1926	..	2	0·03	..	..

The summary of the observations made from these questionnaires is as follows · In most years the admission rate from pleurisy was about 16 per 1,000 of strength, showing a slight decrease year after year, but fell to 12 84 per 1,000 in 1926 Generally observed, about 600 per 1,000 cases pleurisy were recovered to be able to continue their service The rate of invaliding from the service because of pleurisy was 137 per 1,000 of the cases The admission rate of the younger men is always much higher than that of older ones, for instance, ordinary stokers of third class show considerable disposition to pleurisy With regard to the effusion of pleurisy 94 per 1,000 of cases were serious, but those of hemorrhagic or purulent exudation were very few

About ten per cent of the cases later developed tuberculosis

How often are working and living conditions in the Navy conducive to the occurrence of pleurisy ? The solution of this problem belongs to future To day we may only say that the group of younger stokers seem to be much subjected to conditions which might be considered as more predisposing influences

TABLE VIII.

Showing the Number of Cases, the Number of Invalidings and Deaths from Pleurisy

Year	Cases		Deaths		Invalidings	
	Number	Rate per 1,000 of Strength	Number	Rate per 1 000 of Cases	Number	Rate of 1 000 of Cases
1916	878	16 10	4	3 85	168	161 69
1917	957	16 43	10	9 22	99	91 24
1918	1,291	21 78	18	10 31	263	150·63
1919	1,323	21 03	23	12 81	269	149 86
1920	1,185	18 80	18	11 76	209	136 51
1921	1,349	18 79	22	13 92	250	158 23
1922	1,250	18 03	10	6 74	208	140·16
1923	988	15 20	2	1 64	243	199 84
1924	891	13 78	16	15 05	133	125 12
1925	889	10 58	8	9 35	130	151 87
1926	882	12 81	19	17 53	142	131 00

This is a brief account of decrease of the number of the kakke cases in the Japanese Navy. Such improvement, in a large measure, is believed to result from the changes in the dietary system, which was introduced by the late Baron Takagi.

This change consisted in that whereas in the old system the food of men was prepared according to certain fixed value in money, in the new system the food is prepared according to quality and quantity. Up to 1885 the ration of the men was rice and some other nutritive and massive materials leaving the quality and quantity of other food to the free choice of the men. Since 1885 rice and barley have been supplied as the principal food in equal proportion.

Kakke is found frequently from the end of spring to summer, but it is not limited to the warm season; sometimes it is found during very severe winter. In the Japanese Navy a comparatively large number of kakke is found from May to September, which is almost the same from year to year.

TABLE VII.

Showing the Number of Cases and Deaths from Kakke.

Year.	Cases.		Deaths.		Rate per 1,000 of Strength.
	Number.	Rate per 1,000 of Strength.	Number.	Rate per 1,000 of Strength.	
1916 ..	321	2·22	..	..	..
1917 ..	48	0·82	1	0·02	19·23
1918 ..	157	2·65	2	0·03	11·90
1919 ..	300	4·77	2	0·03	6·02
1920 ..	256	4·06	1	0·02	3·48
1921 ..	319	4·44	6	0·08	16·90
1922 ..	164	2·37	2	0·03	9·22
1923 ..	156	2·40	4	0·06	23·53
1924 ..	269	4·16	3	0·05	10·68
1925 ..	320	4·92	1	0·02	2·99
1926 ..	346	5·05	2	0·03	5·33

PLEURISY.

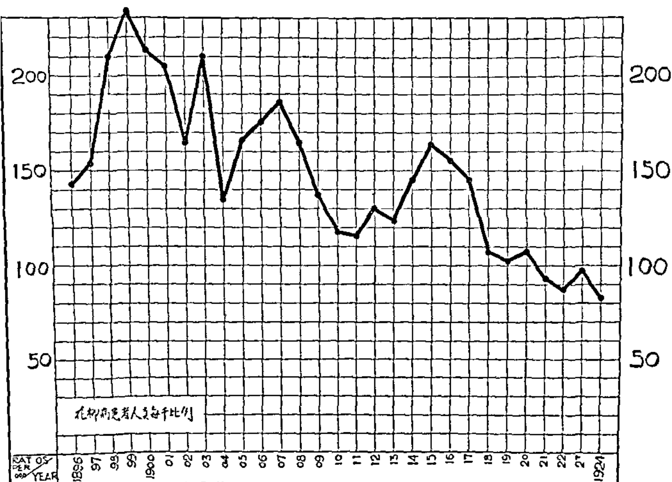
Since 1923, on account of the large number of men disabled from pleurisy, all the medical officers of the Japanese Navy have been required to fill in a questionnaire for every case notified as pleurisy so that each case could be considered separately with regard to occupation and probable cause, etc.

In 1926 the admission rate for venereal diseases was 94.74 per 1,000 of strength, a decrease of 106.26, as compared with the average rate

It is believed that without the use of preventing tubes, which makes the application of chemical agents to secure such disinfection as is possible after exposure,

CHART III

Showing the Number of Cases of Venereal Diseases per 1,000 enlisted Men in the Japanese Navy from 1896 to 1924



the admission rate of venereal disease in the Navy will undoubtedly be much higher than it is now

To observe the real effect of the free issue of the prophylactic tube, during the recent two years, a careful statistical study was made by the surgeons of the Fleets

Pulmonary Tuberculosis.

In 1926 there were 384 admissions to the sick list for pulmonary tuberculosis, making the rate 5·60 per 1,000 of strength.

The admission rate for pulmonary tuberculosis appears to be almost constant. The intention of the Medical Department of the Japanese Navy is to hold the patients from tuberculosis in naval hospitals or in a naval sanatorium until their condition has completely improved for discharge, but in other cases the patients are discharged at their own request, in order that they may return to their homes.

Table IX.

Showing the Number of Cases and Deaths from Pulmonary Tuberculosis.

Year.	Cases.		Deaths.		Rate per 1,000 of Strength.
	Number.	Rate per 1,000 of Strength.	Number.	Rate per 1,000 of Strength.	
1916 ..	321	5·89	22	0·40	62·86
1917 ..	304	5·22	20	0·34	57·80
1918 ..	326	5·50	47	0·79	125·33
1919 ..	433	6·88	45	0·72	88·58
1920 ..	424	6·73	52	0·83	109·70
1921 ..	435	6·06	47	0·65	93·25
1922 ..	426	6·15	74	1·07	161·93
1923 ..	455	7·00	52	0·80	102·16
1924 ..	498	7·70	68	1·05	112·21
1925 ..	401	6·16	81	1·24	149·45
1926 ..	384	5·60	52	0·76	107·00

Venereal Diseases.

In most years, there has been the mean admission rate of 200 per 1,000 of strength on account of all forms of venereal diseases. The increase in the rate of admission after every war-period was striking. It was undoubtedly to be said that in the Japanese Navy all the preventing measures for venereal diseases in earlier period were not very effective.

Since the past five years the admission rate from venereal diseases in the Japanese Navy tended to decrease. Since 1924 the preventing tubes are distributed to all corps and the tendency toward a gradual decrease appears to be continuing.

BESREDKA'S CHOLERA BILIVACCIN VERSUS ANTI-CHOLERA VACCINE: A COMPARATIVE FIELD TEST

BY

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For many years past, the constantly recurring epidemics of cholera in India WED have been a matter of grave anxiety not only to the Governments of this country, DEC but to other nations of the world. Whilst considerable attention has been given 2 TO to the study of the epidemiology of cholera and many obscure points have been made clear, effective control of the disease still constitutes an extremely difficult problem and public health workers in India are only too anxious to utilize every possible means to reduce its incidence. When, therefore, it was suggested by the Office Internationale D'Hygiene Publique that experiments with Besredka's cholera bilivaccin should be made in India, the Public Health Commissioner with the Government of India had no difficulty in arranging for tests to be carried out in several Provinces. With financial assistance from the Indian Research Fund Association, a comparative field test of the bilivaccin and the well-known anti-cholera vaccine was commenced in Madras Presidency in December 1925. After 18 months work, covering three different epidemics, a report was submitted to the League of Nations (Health Section) and to the 'Office Internationale' in July of this year, with a view to early publication of the results. It seems appropriate, however, even at the risk of repetition, to place a résumé of the report before this Congress, especially as it is being held in the centre of Bengal, which has for long been known as the endemic home of cholera.

2. The tests with the two vaccines were carried out in the deltaic tracts lying at the mouth of the Cauvery river, that area having been definitely proved to be an endemic centre for the disease. The vaccines were administered only in villages which were at the time actually infected with cholera, and record cards were kept not only of every person treated but of a sufficient number of untreated controls. The field staff, consisting of eight medical officers, carried out the immunization of as many persons as possible in these cholera

Such observations were made from anonymous questionnaires and the result is shown as follows:—

Total number of observed personnel .. .. .. 6·089
Period of observation from January 1926 to April 1926.
Total number of personnel who were unwilling to run the risk of infection .. .. 2·513
Total number of personnel who were exposed .. 3·576
Total number of personnel who has used the prophylactic tubes .. .. 2·066
Infection rate per 100 of personnel who has used the preventing tubes .. .. 3·9
Infection rate per 100 of personnel who has not used the tube 8·7

Hereby it was also observed that the infection can be completely prevented by the careful use of preventing tube immediately after exposure.

There are many men whose habit makes them unwilling to run the risk of infection from venereal disease, and we are encouraging them to increase their number by every kind of education.

TABLE X.

Showing the Admission Rate of Venereal Diseases per 1,000 of Strength.

Year.	All Forms.	Gonorrhœa.	Syphilis.	Chancroid.
1916 ..	154·74	60·76	45·50	48·47
1917 ..	137·79	52·66	40·75	43·38
1918 ..	108·79	45·98	24·68	38·13
1919 ..	101·12	43·07	20·28	37·78
1920 ..	109·51	39·21	22·60	47·70
1921 ..	91·45	36·88	17·80	36·78
1922 ..	89·60	36·09	18·48	35·02
1923 ..	98·18	36·70	20·57	40·91
1924 ..	83·04	35·72	16·54	30·78
1925 ..	82·38	33·50	17·54	31·34
1926 ..	94·74	39·49	21·29	33·96

To conclude, I am very glad to be able to note that the vital statistics of the Japanese Navy shows, year after year, a downward trend of morbidity and mortality. In fact the hygienic and sanitary conditions of the Japanese Navy have been considerably improved in recent years. The Medical Bureau shall continue to promote the activity and research works of medical officers for improvement of hygienic conditions of the entire Navy.

6 Bilivaccin

Table I

Total number of persons under observation, 17,080

		Attacks	Deaths	Percentage attacked	Percentage mortality among attacked
Number given three doses of bilivaccin	4 982	18	4	0 36	22 2
Number not treated (controls)	11 004	222	93	2 02	41 9

N B—The number of persons given only one dose or two doses of bilivaccin have been excluded from this and the succeeding tables

Of the 17,080 persons under observation, 3,468 were in direct contact in the same house with cholera cases within three days before, or subsequent to, the administration of the bilivaccin

Table II

Total number of contacts, 3,468

		Attacks	Deaths	Percentage attacked	Percentage mortality among attacked
Number given three doses of bilivaccin	1 011	18	4	1 8	22 2
Number not treated (controls)	2,172	222	93	10 2	41 9

N B—The figures for attacks and deaths are the same in both Tables I and II, because, immediately a case of cholera occurred in a house, the persons of that house automatically became direct contacts

These tables show that the unprotected were attacked 5 6 times more frequently than those given the full course of bilivaccin The precentage mortality amongst the persons attacked in the former was also nearly twice that amongst the persons attacked in the latter group

infected villages, and, after the epidemics subsided, was employed in checking the records, and in collecting details of all cholera attacks and deaths, which had occurred among immunized persons and the controls during the three months period following the administration of the vaccines. Field tests of this kind are extremely difficult to carry out, but the record cards were scrutinized with the greatest care, and all doubtful cases were excluded before the statistical analyses were undertaken. Elements of selection, however, cannot altogether be avoided.

3. The vaccines were administered in 360 villages having a total population of about 650,000. Anti-cholera vaccine alone was given in 236, and bilivaccin alone in 52, villages. In the remaining 72 villages, the two vaccines were used side by side, about a third of the population being given inoculations, another third being treated with the bilivaccin, and the remaining third being taken as controls. In analysing the records, a differentiation was made between (*a*) persons who were actually living in contact with cholera cases in the same house, and (*b*) those who, though residing in the same village, were not living in infected houses. This was done in order to meet the possible criticism that the latter group of persons was not really exposed to the danger of attack with the cholera vibrio. In this connection, however, it must be remembered that in the average Indian rural village, the inhabitants live under identical conditions as regards water, food and sanitation. The method adopted put the vaccines to a very severe test, but made it possible to draw definite conclusions from the correlation coefficients obtained for the different groups of persons under observation.

4. It is essential, in carrying out experiments of this kind, to exclude as far as possible all factors which may by themselves influence results. The large numbers of persons under observation, the identical conditions under which the vaccines were administered and the care exercised in excluding age and sex factors from the different groups were sufficient to avoid three important fallacies often met with in experimental work. Moreover, no fallacy exists in the statistics as regards better and more prompt treatment of vaccinated persons as compared with unvaccinated, because, generally speaking, no treatment of any value is available in the average Indian village.

5. In the literature issued with Besredka's bilivaccin, it is stated that 'an infinitesimal number (about 4 per cent) of subjects suffer from reactions, which, however, are very slight and always benign.' Cornwall and Lafrenais(3) and other writers have ascribed to bile a very noxious effect on the mucosa of the stomach and intestine, and this observation is to some extent confirmed by the experiences of the field staff in Madras. Their reports indicate that the bilivaccin sometimes produced acute diarrhœa of such a severe type that the persons affected refused to take further doses, and, in certain cases indeed, the medical officers were accused of inducing cholera. Fortunately, no untoward incident occurred, as those affected quickly recovered.

10 Statistical analyses

The total numbers treated were as follows —

Bilivaccin	(*a*) One dose only (B1)	611
	(*b*) Two doses only (B2)	483
	(*c*) Three doses (B3)	4,982
Anti cholera vaccine	(*a*) One inoculation (A1)	17,160
	(*b*) Two inoculations (A2)	8,485

As B1 and B2 did not show any relationship which could not be attributed to chance these groups were given no further consideration

Karl Pearson's method of fourfold correlation was used for the determination of the coefficients of correlation, and the complete series of correlations is shown in the following table —

	Groups		χ^2	P	r_p	r PE
Anti cholera vaccine	(1)	A1	68.6610	$10^{-14}\times 0.823190$	0.152587	-0.180338 ± 0.01285
	(1) (a)	A1 (con)	84.9200	$10^{-17}\times 0.268658$	0.246661	-0.277745 ± 0.01800
	(2)	$A1_3$	163.4260	$10^{-34}\times 0.332880$	0.251608	-0.324443 ± 0.01251
	(2) (a)	$A1_3$ (con)	190.6780	$10^{-40}\times 0.435111$	0.353848	-0.462465 ± 0.01665
	(3)	$A1_5$	192.7390	$10^{-40}\times 0.229087$	0.252744	-0.372891 ± 0.01225
	(3) (a)	$A1_5$ (con)	222.7570	$10^{-47}\times 0.506874$	0.412864	-0.519238 ± 0.01594
	(4)	A2	82.5829	$10^{-17}\times 0.854476$	0.201995	-0.289429 ± 0.01506
	(4) (a)	A2 (con)	126.9570	$10^{-26}\times 0.248485$	0.343568	-0.460229 ± 0.1856
Bilivaccin	(5)	B3	63.6107	$10^{-13}\times 0.991517$	0.246303	-0.346938 ± 0.02038
	(5) (a)	B3 (con)	70.5002	$10^{-14}\times 0.333426$	0.331137	-0.444612 ± 0.02495
	(6)	$B3_3$	77.0744	$10^{-15}\times 0.130617$	0.275195	-0.413727 ± 0.01969
	(6) (a)	$B3_3$ (con)	84.8184	$10^{-17}\times 0.283792$	0.367276	-0.521605 ± 0.02350

The subscript 'con' indicates group of direct contacts

$A1_3$ is a group excluding all attacks occurring within 3 days of one inoculation

$A1_5$ a similar group excluding all attacks occurring within 5 days after one inoculation

$B3_3$ a group excluding all attacks which occurred within 3 days after the full treatment with bilivaccin

7. Anti-cholera vaccine.

Table III.

Total number of persons under observation, 54,899.

		Attacks.	Deaths.	Percentage attacked.	Percentage mortality among attacked.
Number of persons given one dose (½ c.c.) ..	17,160	59*	25	0·34	37·3
Number of persons given two doses (1½ c.cs.) ..	8,485	31	2	0·37	6·5
Number of persons not treated (controls) ..	25,645	489	184	1·67	37·6

**N.B.*—An additional 71 attacks and 19 deaths took place in this group within three days after inoculation. As it is reasonable to assume that these persons were infected before they were inoculated, or had not developed any degree of immunity before they contracted the disease, they have been excluded.

Of the 54,899 persons under observation, 6,826 were in direct contact with cholera cases in the same house within three days before, or subsequent to, in inoculation.

Table IV.

Total number of contacts, 6,826.

		Attacks.	Deaths.	Percentage attacked.	Percentage mortality among attacked.
Number of persons given one dose (½ c.c.) ..	2,116	59*	25*	2·8	37·3
Number of persons given two doses (1½ c.cs.) ..	1,250	31	2	2·5	6·5
Number not treated (controls)	3,366	489	184	14·1	37·6

**N.B.*—These numbers, as before, exclude all attacks and deaths which occurred within three days after inoculation.

Amongst direct contacts, the unprotected were attacked 5·6 times more frequently than those inoculated twice. The percentage mortality amongst the attacked in the former was also 5·8 times higher than that amongst the attacked in the latter group.

8. So far as these figures go, the indication seems to be that the bilivaccin (full dosage) gives much the same degree of protection from attack as the double inoculation with anti-cholera vaccine. The latter, however, contains only 8,000 millions of the cholera bacillus per c.c., whilst the three doses of bilivaccin contain over 200 billions.

9. In the 72 villages where the two vaccines were given side by side, the results were comparable with those given in Tables I to IV.

17 The protective effect of a full course of bilivaccin is strictly comparable with that of the double inoculation with anti cholera vaccine e g ,

A2 — 0 289429	B3 — 0 346938
A2 (con) = 0 460229	B3 (con) 0 444612

18 The coefficients for B3 and $B3_3$ show that it takes about two to three days for the treated person to develop the maximum immunity conferred by the full treatment with the bilivaccin

B3 — 0 346938	$B3_3$ — —0 4137°2
B3 (con) — 0 444612	$B3_3$ (con) 0 5°1605

19 In every case the coefficients for the whole groups of persons observed are less than those for the groups of direct contacts only indicating that the actual degree of protection conferred is greater than is shown by the general vaccinated population

	Whole Group	Contacts
A1	—0 180338	0 °77°45
$A1_3$	—0 3°4443	0 46°165
$A1_5$	—0 37°891	0 519°38
A2	—0 289429	0 460229
B3	—0 346938	0 444612
$B3_3$	0 4137°°	—0 5°1605

20 The coefficients for $A1_5$ and for $B3_3$ viz ,

A1 —0 3 °891	B3 — 0·4137°°
$A1_5$ (con) 0 519°38	$B3_3$ (con) — —0 5°1605

show that the immunity developed five days after a single dose of anti cholera vaccine is nearly as high as that conferred three days after a full course of oral bilivaccin

21 Remembering the limitations already mentioned it may be inferred that a high degree of immunity is conferred by both the subcutaneous anti cholera vaccine and the oral bilivaccin but that the former is in the long run superior to the latter In view of the fact that with ordinary precautions the risk or

CONCLUSIONS.

11. The coefficients of correlation between treatment with the vaccines and cholera attacks are uniformly negative and significant, two being as high as 0·52. Protection is, therefore, conferred by both vaccines, although the coefficients are not so high as those usually obtained for groups of persons protected against small-pox by vaccine lymph.

12. The coefficients for direct contacts are all between — 0·28 and — 0·52. Treatment with the vaccines has, therefore, conferred a high degree of protection amongst persons directly exposed to infection.

13. Comparing A1 and $A1_3$ groups, it is to be noted that the coefficients for the latter are nearly double those of the former. Of 130 attacks and 44 deaths amongst the ones inoculated, 71 attacks and 19 deaths occurred within 3 days after inoculation, and it is probable that these persons had not developed any degree of immunity when they were attacked with the disease. This inference is supported by the fact that the coefficients further increase in value, when a period of 5 days is allowed for development of immunity.

$A1_3$ =	−0·324423	$A1_5$ =	−0·372891
$A1_3$ (con_3) =	−0·462465	$A1_5$ (con) =	−0·519238

14. The differences between the coefficients for A1 and $A1_3$ and for A1 (con) and $A1_3$ (con) are significant as compared with their probable errors. On the other hand, the differences between $A1_3$ and $A1_5$, and between $A1_3$ (con) and $A1_5$ (con) are not very significant, being only 2·77 and 2·46 times their probable errors respectively. This proves that immunity does not definitely exist until 3 days after inoculation.

15. It was not possible to make any estimation of the development of further immunity after the second inoculation, as the original data did not give the necessary details. If no allowance for development of immunity is made in either case, however, it is seen that two inoculations definitely confer a higher degree of protection than one inoculation, e.g.,

A1 = −0·180338	A1 (con) = −0·277745
A2 = −0·289429	A2 (con) = −0·460229

16. The differences between the coefficients for B3 and $B3_3$ and between B3 (con) and $B3_3$ (con) are not very significant being only 2·36 and 2·25 times their probable errors respectively. This shows that a certain degree of immunity was conferred by the first two doses of bilivaccin, and that immunity further increased two to three days after the third dose.

empirically on the assumption that it should be useful because typhoid vaccine is useful and I have never been able to find any satisfactory evidence or any complete work done to prove the nature and the degree of the immunity which cholera vaccine is alleged to produce. As typhoid fever is a systemic infection and cholera is not, as cholera is an infection of which the living virus is entirely outside the body, in the intestine and is only able to produce symptoms by means of its soluble toxins it is not conceivable that inoculation with cholera vaccine can confer any other than a partial immunity against the absorbed toxins. It cannot reasonably be expected to affect the life or the existence of the cholera vibrios in the intestinal contents it cannot prevent an inoculated person from having his intestine infected with cholera and it cannot therefore be considered to be a preventive measure at all. It may, to some minor extent be a personally protective measure but that is a very different matter.

I find that the chief argument in favour of the use of cholera vaccine is that it has been used extensively with good results and figures are quoted in support of this assertion. In my opinion the more experience and knowledge one has of epidemic cholera the less confidence can one place in any statistics with regard to it. Cholera statistics are complicated by so many unknown or unappreciated factors and are so elusive and full of vagaries that it is not wise to rely upon the obvious statistical conclusions. The reason for this is most probably associated with the rapid spread of the disease and the equally rapid development of immunity in local populations and this again is only explicable by the presence of a cholera active bacteriophage. In my own personal experience of an endemic province with the highest death rate of any province in India I have often found enthusiastic workers reporting that they took preventive measures and stopped the epidemic.' I think these officers deceived themselves and that many people deceive themselves as to the effectiveness of remedies or preventive measures directed against cholera because cholera in its epidemic form dies out just as rapidly as it spreads. The real trouble is that one village is infected and becomes naturally free from cholera in 10 to 20 days whilst the epidemic has spread to many other villages. And so the process continues during the course of the epidemic in the epidemic season. I wish to offer a word of warning to those who flatter themselves that they are able to control epidemic cholera or to prevent it by other than the complete and adequate provision of pure water supplies and water borne sewerage systems. Col Russell has produced a mass of statistical evidence which has been very carefully prepared and elaborated but I think he has omitted to consider these fundamental principles and is attempting to solve the problem of protection on a basis which is too purely mathematical. As I said before cholera statistics are full of vagaries and fallacies. I have here two pieces of statistical evidence which appear to prove the exact opposite of what Col Russell has demonstrated. I do not however, maintain that they do so. I merely contend that they prove my original proposition that statistical evidence in cholera must be accepted with the greatest caution. In the first instance I quote from Col McCombie Young's report on the result of giving cholera vaccine to the majority of the 119 359 coolies sent to the Assam tea gardens in 1919 during about three months from the end of March till the end of June. Most of these coolies were inoculated with 1 c c vaccine at the collecting depots and detained several days before starting on their journey, thus giving the vaccine every chance. There were 372 cases with 216 deaths

injury from inoculation is inappreciable and that even transitory discomfort is uncommon, the case in favour of anti-cholera vaccine as a practical and cheap preventive measure is complete.

REFERENCES.

(1) OTTEN, L. and KIRSCHNER, L. (1927). On Oral and Parental Vaccination against Bacillary Dysentery, *Mededeclingen Van den Dienst Der Volkagezond heid in Ned. Indie*, Vol. I.

(2) MAITRA, G. C. (1926) .. .. Bilivaccin versus Commercial Cholera Vaccine. *Ind. Med. Gaz.*, V. 61, p. 334.

(3) CORNWALL, J. and LAFRENAIS (1924). *Ind. Jour. Med. Res.*, Vol. II.

(4) DIETRICH, W. (1917) .. .. *Kiln. Woch. Schr.*, No. 31.

(5) PROFESSOR KARL PEARSON .. .. 'Tables for Statisticians and Biometricians.' (The very valuable and almost inimitable preface.)

(6) MAJOR GREENWOOD and UDNY YULE. 'The statistics of anti-typhoid and anti-cholera inoculations, and the interpretation of such statistics in general.'

(7) MAYNARD, G. D. (1908) .. .. Statistical study of anti-typhoid inoculations. *Biometrika*, Vol. VI.

(8) ALICE LEE, D.SC. .. .. Tables of the first 20 tetrachoric function to 7 decimal places (with an introductory note by Professor Karl Pearson. *Biometrika*).

(9) PEARSON, KARL (1900) .. .. Mathematical contributions to the theory of Evolution XVIII: 'On a novel method of regarding the association of two variables, classed solely in alternate Biometric series VII, 1912.'

(10) *Idem.* .. .. Mathematical contribution to the theory of Evolution VII: 'On the correlation of characters not quantitatively measurable.' *Phil. Trans. S.* 195.

(11) MACDONNEL, W. R. (1901–02) .. 'On the Influence of Previous Vaccination in Cases of Smallpox.' *Biom.*, Vol. I.

(12) ELDERTON .. .. .. Frequency curves and correlation.

DISCUSSION.

Dr. J. L. Pinto (Bombay): During the cholera epidemic in the Bombay Presidency we carried out large scale anti-cholera inoculations. We have records about this measure in the southern division of the Presidency. Some 43,000 persons were inoculated. Of these some 8,424 were given full treatment—5,241 were given one dose only of 1 c.c., others 0·5 c.c., out of the total inoculated there were 98 attacks with 26 per cent of deaths. Eighty persons were attacked after a dose of vaccine of 0·5. c.c., 13 after a full treatment, and 3 after 1 c.c. Out of 80 attacks, 45 occurred within 5 days. One point of interest is why so many were attacked within 5 days. Is it because of the incubation period or the negative phase? Possibly it was. If 1 c.c. gives no reaction, why not give it straight away in one dose? Bilivaccin was used in 323 persons with 3 attacks which resulted in 2 recoveries and 1 death. The mixture of essential oils was also tried with good results.

Lieut.-Col. W. C. Ross, I.M.S. (Bihar & Orissa): I am aware that cholera vaccine has been extensively used, but I suggest that it has been used to a large extent

that from that day till a year to two ago and possibly also until to day every coolie recruited for the Assam tea gardens is inoculated against cholera before starting on his journey from the recruiting areas to the gardens The experience appeared to me to suggest that cholera inoculation is a reliable protective and later work in other parts of the world has confirmed this impression

I leave it to others to attempt to convince Col Ross

Dr Sutraja Biliya (Madras) I wish to place before this august Congress meeting a few of my observations from my comparatively little experience of cholera work in the Bellary District (Madras Presidency) I shall speak about three points namely (1) Dosage of cholera vaccine (2) Benefits of anti cholera inoculation and (3) Effects of human efforts on outbreaks of cholera

(1) *Dosage of cholera vaccine*—It is known to all Public Health workers how difficult it is to induce masses in this country to submit themselves for inoculation of any kind As it was found still more so to get people twice for anti cholera inoculation I resolved to give 1 c c doses once for all and I had no cause to regret the same in regard to more than the 10 000 inoculations which I have carried out Except for a little more pain subsequently and slight temperature there were no other mishaps such as severe diarrhœa etc People also preferred this method to the two pricks I may therefore say that there is no danger in giving a 1 c c dose once

(2) *Benefits of anti cholera inoculation*—The popularity of anti cholera inoculation in my district gained ground solely from the protection conferred by the operation For want of time I shall mention only one out of several instances in my experience which definitely goes to prove the benefit of inoculation as an anti cholera measure In 1923 on account of severe famine in my district the Government of Madras opened a famine camp To add to the famine and great scarcity of water the inevitable cholera also broke out in the villages surrounding the famine camp where the coolies were encamped There were more than 2 000 persons working in the famine camp and they were returning to their villages every night after the day s work was over Two cases of cholera actually occurred in the camp itself As a preventive measure anti cholera inoculation was resorted to and as the people in the camp were under control, it was possible for me to inoculate them all Though for three days after inoculation there were a few more cases among them there were no cases at all after that although they were living under conditions identical with the rest of the people in the villages where cholera was still continuing due to the adverse conditions I can therefore, affirm from this experience that anti cholera inoculation is beneficial

(3) *Effects of human efforts on outbreaks of cholera*—In my district in one village, which was largely in communication with places outside the district, cholera was an almost annual visitor and used to continue for a long time and take a heavy toll The people who were very stubborn and illiterate had resisted all anti cholera measures After the introduction of the new health scheme when cholera broke out in this village, I went to the place immediately with my staff and camped there After great persuasion and indirect pressure on the people I succeeded in chlorinating the two infected wells which were the sole source of the drinking water supply and adopted other preventive measures as well Cholera was brought under control within three days and it completely disappeared by the end of one week The cases this time were few and the

amongst the inoculated giving a mortality ratio of 66 per cent, whilst amongst the uninoculated there were 90 cases with 19 deaths giving a mortality ratio of 21 per cent. Unfortunately, figures are not given as to the number who were inoculated and the number uninoculated, but the mortality ratios are very interesting.

The second instance occurred in 1920 in a village of 650 inhabitants in which a severe epidemic of cholera caused 60 deaths before any action could be taken. Of the remaining 590 inhabitants, 507 were inoculated and 83 remained uninoculated. During 18 days after inoculation had been carried out but not completed, 27 inoculated persons were attacked and 16 died giving a mortality rate of 60 per cent and during the last 12 days after the inoculation had been finished, 13 persons were attacked. All these were inoculated persons and no uninoculated person was attacked. These figures are also interesting. They may appear to prove something and might be so interpreted but I maintain that neither the figures I have quoted nor Col. Russell's figures really prove very much. There are too many other factors in the case of cholera which cannot be expressed in terms of statistics and mathematics in the present state of our knowledge.

Lastly, I would suggest that d'Herelle's work and the discovery of the bacteriophage offers a much more powerful and definite means of controlling and preventing cholera and that, therefore, it is now futile to advocate the use of a vaccine which is probably if not certainly ineffective, when we have at our disposal a means of controlling and preventing cholera which has infinitely greater possibilities and the use of which is firmly founded on the natural processes of natural immunity.

Lieut.-Col. T. C. McCombie Young, I.M.S. (B. India): Col. Ross has referred to some statistics regarding cholera inoculations with which I was concerned. Perhaps I may be permitted to describe the circumstances, as they are not without some bearing on the value of cholera inoculation. In 1919, the tea industry in Assam was busy recruiting labourers to fill their depleted labour forces, it was a famine year in certain of the recruiting areas, and very large numbers of famine-stricken labourers were being recruited. Shortly after the opening of the recruiting season, cases of cholera became very numerous on the railway and river routes under my charge, the emigration hospitals were choked with dead and dying cholera-stricken labourers and the situation became so serious that I had occasion to visit Calcutta to enlist the assistance of the Tea Association and the labour-recruiting agencies. With the help of Sir Leonard Rogers, the Tea Association was convinced of the desirability of introducing cholera inoculation and with the least possible delay arrangements were completed by them, whereby every labourer received a single dose of cholera vaccine before leaving the recruiting depôts for Assam. The effect was to me most dramatic. As soon as the inoculated coolies appeared on the transit routes, the cholera cases almost ceased, and the result was that in that season about one-quarter of a million labourers passed through our hands *en route* for the tea gardens. We all know how cholera epidemics flare up and die away and the improvement in the situation may have been due to this, but some ' control ' information was available in the cholera mortality statistics for the areas from which these coolies were coming. They showed the usual seasonal upward trend, while the mortality of the inoculated coolies became negligible. The result of this work carried so much conviction to the laymen concerned, viz., the tea planters

ASPECTS CLINIQUES ET ÉPIDÉMIOLOGIQUES DE LA MÉNINGITE CÉRÉBRO SPINALE ÉPIDÉMIQUE DANS L'INDE PORTUGAISE

PAR

LE COL I FROILANO DE MELLO,
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INTRODUCTION

La méningite cérébro spinale épidémique est une maladie nouvelle dans la nosologie de Goa En effet outre quelques cas importés en 1901 par des matelots venus du Portugal avec le germe puisé dans la virulente épidémie qui sévit là bas entre 1902 03 et dont Bettencourt et França nous ont laissé de si importantes études, la maladie était pratiquement inconnue dans cette province

Actuellement endémique dans le département de Salsete et donnant des recrudescences aigues plus ou moins meurtrières, son histoire est des plus intéressantes à plusieurs points de vue, d'autant plus que les descriptions de cette maladie dans les tropiques ne sont pas abondantes

HISTORIQUE

La méningite cérebro spinale épidémique existe dans cette province certainement depuis 1919 D'où aurait elle été importée ? Peut être de l'Afrique Orientale Anglaise, où à cette époque sévissait une grave epidémie à Nairobi et Mombassa, par quelque emigrant porteur de germes ? On n'a pas d éléments pour l'affirmer avec sureté, mais il n'est pas dépourvu d'interet enregistrer que le Dr Wiseman Pinto officier de Santé dans la circonscription sanitaire de Velim, la première contaminée, remarque qu'en 1909 et 1913 il avait trouvé des cas isolés avec de signes évidents de *meningite*

En Décembre 1920, me trouvant au cours d'une inspection sanitaire au sud de Goa on m'informe qu'au village d'Assolna une curieuse maladie sévit sur les enfants de ce village et de deux ou trois autres contigus, determinant souvent la mort au milieu de convulsions et dans un temps relativement court, quelquefois en 24 ou 48 heures

Je demande à voir un cas On me montre un enfant de 2½ ans atteint de fièvre à 38, l'état général est peu grave, apathie, constipation, tympanisme, une légère dispnée malgré l'absence de lésions pulmonaires Une lame de sang est preparée et me montre des nombreux anneaux de *P falciparum* Comme l'enfant traité

people themselves realized the value of human efforts in controlling the outbreak. Ever since that time the people themselves have sent for the health staff as soon as there is any sign of an outbreak of cholera. With this personal experience (there are other instances as well), I cannot believe the statement that cholera outbreaks always die a natural death and that we go there to claim the credit for the improvement. This is not possible, unless we presume that God gave a longer lease of life to outbreaks of cholera before and that he has cut it short now. I trust most of you will agree with me when I say that this is not the case. I, therefore, believe that it is quite possible to check outbreaks of cholera by human effort.

Colonel Froilano de Mello (Portuguese India) : Explained the good results obtained from the anti-choleric vaccination in Portuguese India being practically able to stop the epidemic with inoculations of a single dose, in Goa and in the village of Brancavara (Dai). Anti-choleric vaccination was compulsory in Portuguese India for troops, Customs and Sanitary personnel and for all contacts of a suspect case.

Lieut.-Col. A. J. H. Russell, I.M.S. (Madras), replied : It is particularly gratifying to the reader of a paper to have such a stimulating discussion following his paper.

In Madras we have given up the idea of giving two doses of the cholera vaccine and during the recent epidemics in Madras city and the northern districts of the Presidency, we have given only one single dose of 1 c.c. Since 15th July we have done about 50,000 inoculations and, although it is difficult to prove, I am as certain as I can be that these inoculations have prevented the rise of the epidemic to the high level of incidence we had in 1924 and in 1918.

As regards the negative phase, I am of opinion that this is of small importance in the case of cholera inoculation, as the vaccine gives only a short period of protection. Dr. Pinto's statistics are much too small to permit of any inference being drawn from them.

The statistics presented by Col. Ross, I state without any reservation, are of no value and do not convey the meaning he gave to them. His bacteriophage figures are also ridiculously small and no inference whatever can be drawn from them. It is easy to say that ' Statistics can be made to prove anything.' Those who use these words, however, merely indicate that they know nothing about statistics and the statistical treatment of figures. In any case Col. McCombie Young has not supported Col. Ross, although the figures were collected by the former. Like Dr. Bentley I could quote hundreds of cases to prove the value of inoculation with the cholera vaccine. In July, Adoni, in the Madras Presidency, became infected. Adoni, owing to a succession of dry seasons, was totally deprived of their protected water supply, and in the first three weeks of the epidemic, 750 attacks and nearly 400 deaths occurred. Owing to the influence of the Municipal Chairman and a Khazi, who were inoculated in the open street, over 10,000 persons were inoculated within a few days. As a result the cholera incidence fell suddenly and practically disappeared in a few days, and although the water scarcity had not ceased, no further cholera occurred.

Vers la nuit, le tableau clinique des sujets de mon observation est le suivant

Enfant no° 1 . violentes convulsions avec trismus et opisthotonos, contracture faciale, atteinte indiscutable des centres nerveux, qui me porte à demander par telegramme à mon laboratoire une aiguille pour ponction lombaire Mort en 36 h

Enfant no° 2 tout à fait normal

Enfant no° 3 une certaine excitation qui sera bientôt suivie de convulsions mortelles

L'aiguille pour la ponction lombaire vient d'arriver en même temps que mon assistant, chargé d'études spéciales sur la Malaria, le Dr Braz de Sa Il prend l'index splénique du quartier infecté et constate à peine un chiffre de 12 pour cent, parmi plus d'une centaine d'enfants examinés et même ceux ci n'ayant que des rates légèrement palpables Le village n'est pas donc tres impaludé et l'hypothese malarienne est définitivement abandonnée, comme impuissante a expliquer la génese de tels symptomes ainsi que l'évolution clinique de la maladie Entretemps mon élève, le Dr Gelasio Lobo, nuit tombante fait une enquête clinique dans les maisons ou l'on a enregistré de tels cas Il note le grand nombre des cas gueris par des revulsifs, d'autres par des injections de quinine, ceux ci par des bains chauds, ceux la, parfois, sans aucune médication La guérison est en quelque sorte un facteur contingent et dépendant plutôt de la forme clinique de la maladie et les cas aigus, succombent, malgré bains, quinine et revulsifs ! Il insiste enfin sur le syndrôme nerveux de la maladie

Le délegué de Santé de Salsete, Dr Sequeira Nazareth, dont j'avais requis les services, visite en ma compagnie quelques quartiers d'un village prochain appelé Cuncolim Ici aussi, la maladie a pris quelques maisons, toujours avec la même symptomtologie L'extension épidémique s'impose à notre esprit et le confrere Sequeira Nazareth formule nettement l'hypothése de méningite Il ne manquait que la preve du laboratoire L'enfant No 3 a empiré et des convulsions subintrantes annoncent sa fin prochaine Une ponction lombaire donne issue á un liquide hémorragique dont le culot de centrifugation montre de nombreux diplocoques, ne prenant pas le Gram, soit libres, soit inclus dans l'intérieur des leucocytes

Nous sommes donc en présence de méningite cérébro spinale épidémique Produit par quel agent ? Seul le laboratoire le dira

Pendant un mois je travaille dans cette épidémie, cherchant non seulement à la combattre, mais aussi à étudier autant de points qu ' il m'était possible de le faire dans les circonstances précaires où je travaillais, avec des moyens, pour ainsi dire, d'occasion Ces recherches furent néanmoins le plus complètes possible Et si j'insiste à les résumer, c'est parceque ce fait, ainsi que les doutes et les objections qui surgirent ultérieurement de la part des confreres et les conséquences redoutables qui en découlerent, étendant la maladie pour tout un département et ménaçant des autres coins de la province avec des cas isolés, constituent une page de la nosologie Indo-Portuguaise pleine d'utiles renseignements pour les professionnels travaillant aux tropiques

par la quinine se remet rapidement et ces villages, remplis d'eaux stagnantes ont toujours été signalés comme étant fortement impaludés, je me persuade que le cas en question serait une pernicieuse paludéenne avec atteinte bulbaire.

Dans la dernière semaine de Mars 1921 un telegramme me communique plusieurs cas avec quelques décès. On me demande de faire un diagnostic et d'établir les bases du traitement, en m'informant que, dans les cas plus graves, le tableau clinique simule la méningite cérébro-spinale.

Arrivé immediatement au village, on me montre plusieurs enfants malades: les uns guéris, ou simplement avec un peu de fièvre ; les autres en léthargie ; un, en état typhique, un autre en période préagonique avec des râles et des convulsions généralisées, subintrantes.

Deux courants règnent entretemps parmi les cliniciens : (1) malaria-et il y a des confrères qui affirment que des cas ont été sauvés par la quinine donnée des le début, l'un deux attribuant même le fait de ne pas avoir eu un seul décès aux fortes doses de quinine qu'il injecte, souvent un gr. chez un enfant de moins d'un an ! (2) verminose, puisque que dans plusieurs cas il ya eu des vomissements *apportant* des vers et la santonine a réussi à les faire expulser en plus grand nombre.

Les examens des selles montrent en effet quelques œufs d'Ascaris et Tricocephalus, mais à l'Inde Portugaise ce sont des hôtes habituels qui infestent à peu près 90 pour cent de ses habitants !

Les examens de sang donnent quelques plasmodies ou des leucocytes mélanifères. Mais supposant même qu'il s'agisse du paludisme, ces villages, d'un dégré assez élevé de civilisation, sont incomparablement plus salubres que plusieurs villages des Novas Conquistas, leurs habitants ont l'aspect floride et jouissent d'une apparence et aisance qui sont à cent lieues du teint terreux et des ventres gros des malariens chroniques, les adultes ou n'ont pas eu des fièvres depuis longtemps ou ne signalent que quelque accès banal dans la saison pluvieuse et en tout cas je ne parviens pas à comprendre pourquoi cette soidisant malaria se revêt d'une allure si grave seulement dans ces villages.

Laissant alors de coté toutes les suggestions, je prie mes confrères de me présenter des cas tout récents. Le premier est un enfant de $2\frac{1}{2}$ ans. La maladie a commencé, il y a une heure, avec un vomissement alimentaire et deux selles diarrhéiques. Fièvre à 38. Examen du sang : rare plasmodie falcipare. Paludéen de longue date, au dire du médecin assistant. On prescrit 1 gr. de quinine en 4 injections à donner de 6 à 6 heures.

Le deuxième cas est un garçon de $9\frac{1}{2}$ ans, a eu un vomissement et montre un certain degré d'apathie. Tous les organes normaux. Fièvre à 38. Examen du sang : aucune forme active du paludisme ; quelques leucocytes mélanifères.

Le troisième cas est une fillette de 2 ans d'une famille très distinguée et residant dans une habitation hygiénique et presque seigneuriale. Un vomissement—le terrible vomissement qui est le spectre des mères !—et une selle diarrhéique. L'enfant a perdu sa vivacité habituelle. Rien dans les selles. Examen du sang : à peine un gamète de *P. vivax*.

habituelle de l'incubation et 12 5 pour cent pendant cette période La maladie a donc évolué plutôt sous forme épidémique que contagieuse, dans ce quartier, infecté depuis longtemps, tandis que dans trois autres quartiers infectés récemment n'a, donné que 5, 3 et 2 cas, tous isolés, sporadiques

(b) A Velim dans les quartiers Collaços, Silvas et Mascarenhas, si contigus les uns aux autres qu'ils doivent être considerés dans une vue d'ensemble il y a 258 maisons dont entre Mars à 15 Avril 45 ont eu des decas maladie 31 avec 1 seul cas, 1 avec 3 et 2, 2, 2, cas respectivement en moins de 24 h , 1 avec 2 dont l'intervalle n'a pu être précisé, 3 avec 2 cas entre 2 a 3 jours, 3 avec 3 cas à l'intervalle de 3 jours 4 avec 2 cas apres intervalles de 12, 13, 15, 22 jours

Appliquant le même raisonnement nous avons donc a peine 6 foyers ou les cas se succedèrent dans le délai habituel de la période incubatoire

Dans le quartier Baga 14 foyers infectés avec 1 cas, 2 avec 2 cas entre 2 a 4 jours, ce qui se prête aux mêmes considérations épidémiologiques

(c) A Cuncolim, dans le quartier Bandorã, infecté apres notre arrivée, le nombre des foyers est 111 dont 9 avec la maladie, 1 cas chaque Dans le quartier Murida, aussi infecté recemment, le nombre de foyers est de 195, ceux infectés étant 10 dont 8 avec 1 cas et 2 avec 2 cas chaque en moins de 24 heures En somme épidémicite évidente, contagiosité non demontrée de façon inattaquable

Notre impression sur la contagiosité de la maladie peut être resumée ainsi

(1) Dans les quartiers les plus infectés, 60 pour cent des habitations ont été attaquées, dont 10 pour cent a peine avec plus d'un cas se manifestant dans un intervalle de 4 à 9 jours ce qui peut être interpreté comme *contagion probable*

(2) Propagation par des zones périphériques, pour ainsi dire concentriques.

(3) Si quelquefois des cas sont apparus dans des quartiers ou des villages assez distants, ou bien c'est qu'il s'était produit dans les zones intermédiaires des cas benins dont personne n'avait eu connaissance (fait nettement mis en évidence dans un quartier de Chinchinim riverain d'un quartier infecté d' Assolna) ou bien que les malades ou quelqu'un de leur famille avaient eu des rapports avec les maisons infectées des autres villages

(4) La population hindoue, non chretienne, n'a presque pas été atteinte, quoiqu'habitant souvent les mêmes quartiers et ayant dans ces villages une hygiène inférieure à celle de leurs camarades chretiens, probablement parce que les contactes des premiers avec les malades ont été presque nuls, en raison de leurs habitudes sociales différentes

(5) Les premiers cas apparus dans un village ou dans un quartier nouveau ont quelquefois pu être incontestablement attribués à la contagion des villages infectés, même par l'intermédiaire de personnes adultes saines qui ont déterminé autour d'elles des foyers épidémiques familiaires (cas de Velim, de Cuncolim et de Sirlim, surtout ce dernier)

(6) L'apparition dans quelques quartiers de véritables épidémies d'amygdalites (fait constaté à Carmona) qui ont précédé la maladie regnante et auxquelles on n'a pas attaché d'importance.

Les recherches faites en Avril 1921 comprirent les points suivants (1) (2).

EXTENSION EPIDEMIQUE DE LA MALADIE.

Entre Décembre 1920, à 2 Avril 1921, on n'enregistre que des impressions plutôt cliniques par manque de diagnostic exact et d'informations sûres de la part des habitants, malgré notre enquête personnelle, faite parcourant les foyers, maison par maison, pendant quatre jours.

Village.	Quartiers avec nombreux cas et quelques décès.	Quartiers avec peu de cas et quelques décès.	Quartiers indemnes.	Observations.
Assolnã ..	2	0	5	....
Velim	5	6	15	....
Cuncolim ..	..	2	..	Quelques cas sporadiques dans les quartiers.
Carmona ; Cavelossim ; Cananguinim.	..	..	..	Rares cas sporadiques.

L'impression générale de l'extension épidémique dans les villages plus infectés marqués ci-dessus peut être résumée ainsi : parmi environ 5,000 maisons qui y existent, au moins 300 avaient eu, entre Decembre-Mars, chacune un cas de la maladie regnante, ayant terminé la plupart par la guérison et plusieurs par la mort.

Lors de l'enquête plus de 100 maisons comptaient soit un malade soit un convalescent.

INCIDENCE DE LA MALADIE SUIVANT LES AGES.

La méningite a affecté quasi exclusivement les enfants au dessous de 6 ans, ensuite ceux entre 7-12. Un cas chez un garçon de 18 ans, 1 cas chez une femme d'environ 30 ans, 1 ou 2 cas à peine chez des personnes âgées au dessus de 45 ans.

CONTAGIOSITE DE LA MALADIE.

Notre enquête a incidé sur quelques quartiers des villages infectés et donné de resultats extrêmement intéressants qui cadrent avec l'evolution habituelle des épidemies de méningite. Ainsi :

(*a*) A Assolnã, quartier de *Regedoria*, le nombre des maisons est de 135 dont 32 ou soit 20 pour cent ont eu entre Mars à 15 Avril des cas de maladie destribués de la façon suivante : 24 maisons 1cas ; 2 maisons 2 cas, se succédant avec l'intervalle de 5 jours ; 3 maisons 2 cas chaque, avec des intervalles de 2,13 et 27 jours respectivement ; 1 maison 3 cas en 24 heures et 1 avec 6 jours ; 1 maison 3 cas dont 2 en 24 heures et 1 avec 19 jours. Considérant que la période de l'incubation est de 2 à 5 jours, et excluant par conséquent ceux qui se sont enregistrés avant ou après ce délai, nous avons dans ce quartier 75 pour cent des maisons infectées, avec 1 cas à peine, 12,5 pour cent avec plus d'un cas mais en dehors de la période

cette épidemie c'est la grande fréquence de formes frustes qui passeraient tout a fait inaperçues en dehors de la notion d epidemicité et dont la nature a eté meconnue des practiciens qui ont diagnostiqué leur cas sous les roubriques les plus variees

Analysant ensuite la maladie d apres les groupes des symptomes nous remarquions

Prodromes Nuls rarement lassitude

Debut Subit en pleine sante avec une ou plusieurs selles liquides et un ou deux vomissements muqueux souvent repetés avec ou sans nausees Si ces symptomes ont servi pour que les practiciens etiquetassent la maladie comme une *gastro enterite toxique*—fait qui d ailleurs est arrive en plusieurs pays—nous avons montré le caractere nettement cerebral de ces vomissements une sorte de regurgitation et ajoute que la nausee qui existait dans quelques cas ne pouvait pas s opposer a cette conception pathogenique puisque soit dans la meningite tuberculeuse soit dans la méningite cerebro spinale epidemique les vomissements peuvent etre accompagnés de nausées

Symptomes nerveux subjectifs cephalalgie tete lourde quelquefois cryesthesie crampes et fourmillements (adultes) rachialgie a la palpation de la colonne Hyperesthésie (cas malins)

Symptomes nerveux objectifs anesthésies partielles ou generalisees inégalite pupillaire pas de reaction a la lumiere reflexes rotuleen et plantaire atténués ou abolis contractures soit localisées (oculopalpebrale linguale trisme dans les cas malins rigidité de la nuque dans les cas graves avances main en griffe) soit generalisees (pleurosthotonos opisthotonos) sursauts convulsions gemissements plaintifs periodiques repetes differents du cri hydrencephalique de la meningite tuberculeuse Kernig absent excepte dans 2 cas raie de Trousseau Bruzdinsky absents dans nos cas

Symptomes generaux —Excitation signe en general precurseur de convulsions delire somnolence dans tous les cas stupeur et coma dans les cas graves et malins sudation profuse chez quelques enfants et chez tous les adultes dyspnee presque toujours Foie douloureux au niveau de la vesicule Rate normale Brady ou tachycardie Temp irréguliere tantot a 40 tantot inferieure a la normale la plupart des cas évoluant sans pyrexies élevees la fievre apparaissant lorsqu elle existe apres les premieres 24 heures urines normales ou augmentees la néphrite n ayant éte notée que dans quelques cas par l abus des vésicatoires cantharidiens

DEPUIS QUAND LA MALADIE EXISTE T ELLE DANS CES VILLAGES ?

Les décès furent étiquetés sous des roubriques les plus variées *gastro enterites diarrhee indigestions fievre avec convulsions* et meme *congestion cerebrale* chez des enfants de moins de 2 ans ! Apres que le diagnostic de méningite fut établi ayant vu que des certificate de décès continuaient a apparaitre avec des diagnostics les plus varies tels que *fievre pernicieuse convulsions epileptiques gastro enterite toxique fievre avec vomissements congestion cerebrale fievre et convulsions*, notre eleve G Lobo fut charge de faire une enquete aupres de familles chez lesquelles on avait

Lesions constatees a l'autopsie.

Le cadavre de l'enfant n° 1 a été autopsié dans le cimetière, à la lueur de deux bougies et très rapidement de peur de provoquer de graves troubles parmi la population.

Lésons constatées.—Congestion de la pie-mère ; suffusions hémorragiques dans le périoste cranéen ; très intense congestion de la pie-mère et de l'encéphale ; masse cerebrale molle, saignant partout et s'effaçant sous le bistouri comme du fromage blanc ; quatrième ventricule avec de gros caillots rouges ; lésions dans le rachis presque nulles ; quelques suffusions dans les méninges rachidiennes à la hauteur de la 4 ème à 6 ème vertébre dorsale. En resumé : meningo-encéphalite hemorragique diffuse.

A' remarquer que les frottis des caillots de ventricule montrent de nombreux diplocoques soit libres soit intracellulaires.

Formes cliniques de la maladie.

Notre observation personnelle ainsi que les rapports obligeamment envoyés par les cliniciens montrent que la symptomatologie de cette maladie peut être reduite à 3 types principaux.

(*a*) *Cas malins.*—Début soudain avec une ou deux selles, peu abondantes, liquides, sans caractère spécial ; météorisme abdominal léger ou très prononcé, quelques heures après, un ou plusieurs vomissements, avec ou sans nausées, la matière vomie étant une sorte de mucus aéré. Le petit malade demeure en général normal jusqu'au vomissement, tombant en suite en léthargie qui peut cependant se manifester dès la première dejection. La maladie passe ensuite par une autre phase : une forte constipation suit la diarrhée, des sursauts et un trismus passager se constatent ; les pupilles sont dilatées, inégales et réagissent fortement à la lumière.

La température pendant les premières 24 heures est sousnormale, viennent ensuite les convulsions, soit généralisées, soit partielles, souvent localisées à la région oculopalpébrale et à la langue. Hyperesthésie au début, perte de sensibilité et de reflexes rotuliens ensuite. Reflexe plantaire aboli. Bradycardie ou tachycardie. Dyspnée *sine materia*. Mort.

(*b*) *Cas graves.*—Début par vomissements ou déjections. Somnolence, sursauts, trisme.—Reflexes abolis ou attenués. En general pas de convulsions. Constipation ultérieure, météorisme abdominal.

(*c*) *Cas bénins.*—Tout se borne à un vomissement ou à une déjection avec un léger météorisme abdominal.

Nous avons observé—ainsi que tous les cliniciens exerçant dans ces villages—des *formes foudroyantes*, la mort survenant au milieu de convulsions, 5 heures après le début de la maladie ; des *formes recurrentes* des enfants ayant même été atteintes 4 fois dans un delai de 3 mois et jouissant d'une parfaite santé pendant les intervalles qui ont quequefois duré 3 semaines ; de rares *formes à marche lente* se terminant généralement par la mort après 19 à 24 jours ; mais ce qui constitue l'intérêt de

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Et en tête de ces symptômes viennent ceux atteignant le système nerveux et l'intestin D'ailleurs le peuple qui possède une expérience si douloureuse de cette maladie, l'a depuis longtemps baptisée comme *maladie de vomissements* et *maladie qui attaque le cerveau !*

Travaux bactériologiques

Les recherches bactériologiques dans les conditions qui m'entouraient n'ont pas été nécessairement des plus parfaites Néanmoins les éléments trouvés ont été de nature à donner raison aux mesures, que j'allais employer comme hygiéniste Les voici

(*a*) les constatations bactériologiques faites dans 6 cas ont montré des diplo coques Gram négatifs, plus ou moins réniformes, souvent en occi isolés, rarement en tétrades, jamais en chaînes

(*b*) 2 liquides céphalo rachidiens clairs (on a trouvé fréquemment des liquides clairs dans cette épidémie) ont donné sur agar sang humain et gelose sang de lapins une culture où les formes en diplo abondent bientôt remplacées par des formes géantes qui augmentent avec l'âge de la culture

(*c*) agglutination positive de ce microbe avec un sérum antiméningococcique jusqu'à 1 1000

(*d*) précipito réaction d'un liquide céphalo rachidien clair positive au bout de deux heures, le tube témoin restant parfaitement clair

(*e*) la preuve des lysines dans les veines d'un lapin (¼ de c c serum plus 1 anse de culture) donne une excitation insolite à l'animal qui se remet au bout de 2 heures , une injection identique dans le rachis de cobaye est suivie de mort 1½ heures après A l'autopsie légère congestion cérébrale

(*f*) inoculations aux lapins et cobayes par voies intrapéritoneale, intraveineuse et intrarachidienne negatives , inoculation à deux singes par voie intrarachidienne suivie de mort après 1 jours *à l'autopsie congestion et hemorragie de l'encephale* et des méninges Présence de diplocoques Gram négatifs

Le serum employé dans ces essais n'était pas monovalent, dont je ne possedais pas aucun échantillon

Campagne antiméningitique

Il faut remarquer que travaillant dans au milieu rural, en dehors de tout outillage laboratorial perfectionné, parmi une population hostile aux médecins officiels et profondément affigée par la mortalité enfantine, je devais rapidement poser non seulement le diagnostic, mais encore les règles de la prophylaxie Toutes les notes cliniques, épidémiologiques et laboratoriales (sauf quelques inoculations et l'enquête sur le temps depuis lequel la maladie sévit dans ces villages) furent prises entre 30 Mars à 2 Avril 1921. Le 3 Avril je commençais la compagne contre la méningite On ne pouvait pas agir plus rapidement ! Je me dédiai non seulement à mettre en exécution les principes de la technique professionnelle, mais encore à organiser les brigades sanitaires avec l'aide de cliniciens de ces villages et de

enregistré des décès infantiles sous de telles roubriques suspectes. Et on vérifia avec étonnement que ces morts survenues en 1919 et 1920, étaient causées par une maladie analogue à la maladie actuelle.

Pour exemplifier : L'enfant R. D., agé de 11 mois, certificat de décès *fièvre et convulsions* est mort en 6 jours avec fièvre et convulsions en Juillet 1919 ; l'enfant F. de S. S., agé de 2 ans, certificat de décès *convulsions* est mort en 12 jours avec fièvre, diarrhée, vomissements ayant expulsé des Ascaris, léthargie et convulsions, en Janvier 1919 ; l'enfant F. de R. C., agé d'un an, certificat de décès *congestion cérébrale*, est mort en 5 jours avec fièvre, léthargie, sueurs abondantes, météorisme abdominal.

Nous considérons donc tous ces cas comme ayant probablement une étiologie identique et consultant les statstiques du Bureau de l'Etat Civil nous vérifions que non seulement entre 1919 à Avril 1921, 96 décès sur 298 ou soit 35 pour cent sont dûs à de tels diagnostics mais encore que la localisation anatomo-clinique n'était pas restée inaperçue dans quelques cas puisqu'en 1919 et 1920 on rencontre 6 décès comme étant causés par la *méningite*, tout court.

Les causes de la mort de ces 96 décès sont signalées dans les documents de l'Etat Civil comme il suit : 1919. Intoxication intestinale 1, Tétanie 2, Congestion cérébrale 5, Atonie intestinale 1, Méningite 3, convulsions 9, péritonite 1, Fièvre pernicieuse 1, Diarrhée d'indigestion 2, convulsions d'indigestion 2, Epilepsie 1, pernicieuse algide 1, entérite aigue 2, fièvre avec convulsion 1, méningite tuberculeuse 1, convulsions avec ascaris 1, indigestion et vomissements 2, diarrhée et vomissements 2 ; 1920. Perniceuse cérébrale 1, méningite 3, tétanie 1, convulsions 6, péritonite 1, congestion cérébrale 6, entérite aigue 1, acidose 1, pernicieuse 4, gastro-entérite 3, fièvre algide 1, indigestion 1, convulsions lumbricoides 1, malaria cérébrale 1, convulsions de malaria (?) 1 ; 1921 *méningite cérébro-spinale* 14 (ces cas après notre diagnostic), gastro-entérite toxique 3, congestion cérébrale 9, fièvre avec convulsions 1, vomissements et convulsions 1, tétanos 1, malaria cérébrale 1 ; fièvre pernicieuse et convulsions 1, convulsions 1, entérite chronique 1.

Une vue retrospective sur tous ces diagnostics et l'assurance que je peux donner que ces villages sont très salubres, même sous le point de vue de malaria—tellement salubres que je ne saurais accepter sans contrôle l'existence des soidisant pernicieuses malariennes qui dans la partie de Goa connue comme *Velhas Conquistas* sont une rarissime curiosité pathologique et dans ces villages n'existent que rarement, des cas diagnostiqués comme tels étant surtout dûs à de vraies confusions surtout avec la grippe et plusieurs autres états febrils comme il arrive si souvent dans la clinique rurale dans les tropiques—nous font voir que laissant de coté quelques cas obscurs (*épilepsie, méningite tuberculeuse, t'tanos, p'ritonite*) et les soidisants diagnostics étiopathogéniques (*l'acidose*, par exemple, qui repondait à ce moment à la vulgarisation dans la presse medicale des doctrines concernant *l'acétonémie* infantile), chaque diagnostic correspond jusqu'à certain point à un symptôme dominant.

en Mai en Europe, suivais plus tard pour Angola restant dans ce tour 3 ans dehors de cette Province

Seconde étape dans l'histoire de la méningite

Les problemes d'ordre clinique, étiologique, épidemiologique et prophylaxique venaient d'etre nettement posés Evidemment pas épuisés, cela va sans dire ! Mais que l'on me laisse affirmer ils pourraient etre perfectionnes, non cependant detruits !

Neanmoins fût-ce que la panique des premiers moments eût jete le doute dans l'esprit des autorités sanitaires vis a vis de la vague de plus de plus en plus croissante des cliniciens qui n'acceptaient pas le diagnostic de méningite cérébro spinale epidemique, fût ce par quelque autre motif, le chef du Service de Santé mon prédecesseur, ordonnait de nouvelles recherches sur l'étiologie du mal un liquido cephalo rachidien apporte de Salsete par les medecins Barros et Monteiro donna un diplocoque intracellulaire Gram négatif à l examen microscopique fait par le confrere G Correa Manque de moyens appropriés les recherches sur ce diplocoque ne furent pas continuées(3)

Et le diagnostic continuant a être combattu ! En vain une autopsie, faite en Novembre 1921, à la requisition de la justice, pour une mort d'enfant imputée au bain chaud donné par un clinicien montrera des signes d'inflammation des méninges et de l'encephale, et le liquide céphalo rachidien louche, séro prulent portant les experts à poser le diagnostic de méningite cérébro spinale comme cause de cette mort La vague méningitophobe envahit tout le corps médical du Départe ment de Salsete ou seuls les deux delegués officiels, restent fideles et proclament a haute voix leur conviction, bientot mise au compte d'une soumission intellectuelle a l'opinion de leurs chefs sanitaires

Les mesures que j'avais mises en execution et furent si sympathiquement accueillies par la population sont mises de coté Le doute envahit l'Assemblée législative de la Colonie et le projet de loi donnant crops aux principes fondamentaux de ces mesures notification, isolement domiciliaire et traitement prophylactique des rhino pharynx présenté par le Chef du Service de Santé, mon predecesseur, est rejeté et ne mérite que le sourire de l'oubli bienveillant que l'on voue aux manies inopportunes !

Je rentre dans la Colonie vars Noel 1923 et suis mis au courant de cette campagne par des amis dévoués, non professionnels, recrutés dans ces villages simplement à cause de l activité que j'avais alors developpée

On m'informe que les cliniciens affirmaient

(a) que la maladie n'était pas la méningite cerébro spinale

(b) que pour les uns elle était une *lombricose*, pour les autres une *acidose*, pour les troisiemes une *gastro enterite* De rares cliniciens, à la vue de symptômes cerebraux indiscutables, classifiaient quelques cas comme *grippe cerebrale*

A'quoi bon affirmer que l' Ascaris et le Tricocephale infestent environ 90 pour cent de la population de Goa et que la maladie en question se montre avec la

pourvoir aux besoins financiers avec le concours des corporations local liquides antiseptiques, glace pour les malades, moyens de transp médecins, division des villages en zones, instructions imprimées, tout é de fonctionner le 5 Avril. N'ayant pas le temps de faire des rapports laissés aux médecins officiels à mes ordres, les principes qui g campagne furent.

(1) Maladie contagieuse, le vecteur du contage étant non seulemer mais encore les convalescents et les contactes, constituant la dangere porteurs de germes. Dans les villages indiqués, le manque de la notic giosité ayant été absolu avant notre diagnostic, on doit consid toute la population comme suspecte d'abriter le méningocoque d pharynx.

(2) La vitalité du méningocoque dans les rhino-pharynx dur trois semaines et l'infection méningococcique peut s'extérioriser se l'inflammation des amygdales ou de la muqueuse nasale. La ménin spinale n'est qu'un épiphénomène survenant comme une complicat cours des rhynites, amygdalites ou rhino-pharyngites méningococci très fréquentes.

(3) Le premier chapitre de la prophylaxie d'une maladie infect est la *notification obligatoire.* Cette notification doit s'étendre même pectes, d'autant plus qu'une grande majorité des cas ont été frustes.

(4) Isolement du malade et desinfection de ses effets. Etant possibilité d'organiser des hôpitaux d'isolement dans des aires si éte ci devra être domiciliaire.

(5) Dans quelques quartiers où la maladie a formé des foyers vir l'encombrement des maisons obscures et peu hygiéniques le command fection générale des domiciles par la flamme rapide du foin br que nous employons souvent dans le pays) ne serait pas à déconseill fragilité du meningocoque en milieu externe.

(6) Evacuation du quartier, dûment reglée par l'autorité sanitai besoin.

(7) Prophylaxie des suspectes par des antiseptiques (badigeonnages iodo-iodurée suivie de gargarismes de chlorogène à 1/2000 contin quatre jours deux fois par jour, prophylaxie générale de la populat inhalations iodo-guaiacol-thymolées, continuées pendant 3 à 4 sem par jour, chaque inhalation durant au moins 3 minutes chaque fois.

Les résultats de cette lutte ne se firent pas attendre. Le nomb par *méningite* qui en Avril comptait par 34 tomba à 24 en Mai, à 6 en J joignons à ces chiffres les roubriques diagnostiques suspectes qui encore opiniâtrement à apparaître dans les certificats ces chiffres 48, 27 et 10, respectivement. Une chute brusque! Effet de prophylaxie ?

rien, les vomissements sont fréquents et constants et tellement irresistibles qu'ils peuvent être classifiés d'incoercibles Ces cas sont parfois compliqués de crises convulsives se limitant à quelques acces ou se multipliant tellement que la mort est fatale en 24,48 h ou vers le troisieme jour Ainsi dans un délai de trois jours le maximum, la maladie est terminee ou par la guérison ce qui est plus fréquent ou par la mort, ce qui est plus rare

' D'autres formes, moins fréquentes un enfant en pleine santé, sans aucune plainte, sans que personne puisse soupçonner qu'l sera bientot affecte par la maladie, se couche la nuit et soudainement vers l'aube, se reveille et est pris d'une soif violente et demande a boire , bientôt devient agité et tombe en stupeur ou coma, constipation invencible, sans aucun vestige de fievre ou de la moindre altération de la temperature, jusqu' a ce que les crises convulsives apparaissent, et l'enfant, le ventre mou et flasque, meurt en moins de 24 heures, ayant émis un peu avant la mort, spontanément ou avec l'aide des lavements, des selles contenant quelques corps étrangers, semences de jambul, petit pois, morceaux de pommes non digérés—et la mort, erronément, est attribuée a ces corps '

' En géneral dans toutes ces formes, benignes ou malignes, l'elevation thérmique manque et lorsqu'elle existe c est presque toujours dans les formes benignes, non des le debut ce qui serait l'exception, mais a la fin du premier jour ou dans le deuxieme, la température oscillant entre 99 a 100 Fahr et semblant constituer un signe de bon pronostic '

L'auteur a vu des cas avec de légeres contractures de la nuque et des membres superieurs ou inférieurs, ces formes étant en géneral fatales n'ayant pas présenté ni fievre ni Kernig •

On observe aussi, surtout chez des enfants de bas âge des formes suivantes ' au cours d'un repas, l'enfant a un vomissement, qui semble un incident sans importance d'autant plus que l'enfant se porte bien ensuite pendant quelques heures et, soudainement, le cortége symptomatique s'établit avec un desolante brutalité lethargie, stupeur, résolution musculaire generale crises convulsives mort '

Plusieurs enfants ont eu deux ou trois rechutes ou recidives, avec quelques semaines a quelques mois d'intervalle, succombant souvent dans une de ces rechutes

L'auteur remarque ensuite la faible contagiosité de la maladie , la difficulté d'établir un pourcentage de la mortalité a cause des étiquettes diagnostiques variees telles que *gastro enterite, indigestion aigue, toxemie, convulsions infantiles* , la saison épidémique qui correspond a la periode decoulant entre Janvier Avril, avec l'acmé entre Février Mars , des cas isolés sporadiques occurrant dans les autres mois et donnant des recrudescences entre Septembre Décembre , les âges qui payent le plus lourd tribut étant jusqu'a 12 a 15 ans, toujours avec les mêmes symptômes et tres rarement les adultes , la rareté de l'infection chez des enfants hindoues et maures, explicable par la différence de coutumes et manque de rapports entre la population chretienne et non chretienne , la persistence de l'infection non seulement

symptômatologie décrite, inaltérable à travers de ces années, seulement dans quelques villages de Salsette ! A'quoi bon montrer que cette soidisant *acidose* localisée primitivement dans le Sud du département avance de proche en proche et fait de nouvelles victimes dans d'autres villages ! A'quoi bon faire voir qu'il n'y a pas des *gastro-entérites* épidémiques, étiquetées comme telles en pathologie et que dans ces soidisant *yastro-entérites* on trouve chez les cas plus typiques un ensemble symptômatique (vomissements, tympanysme, léthargie, flaccidite musculaire, convulsions) d'un caractère nettement cérébral ! A'quoi bon se demander pourquoi cette soidisant grippe se revêt de ce masque seulement dans ces villages et pourquoi on enregistre de tels cas, lorsqu'il n'y a pas même de grippe dans le pays !

Je propose de faire de nouvelles études cliniques et bactériologiques. Les ponctions et les cultures devraient être faites par le délegué de la circonscription primitivement contaminée, puisque, étant originaire de ces villages inspirerait plus de confiance au peuple qui ne permettrait aucunement ces ponctions aux autres médecins officiels. La proposition a la même destinée du project de loi antérieur, mais les données cliniques sont cueillies dans un magnifique rapport où l'on montre à la face de la seule clinique les analogies et les dissemblances de la maladie enfantine avec la méningite cérébro-spinale décrite par les classiques, tels que Dopter et Netter et Débré(4, 5). Quelques transcriptions de cet interessant rapport, purement clinique, en m'astreignant le plus possible aux mots de l'auteur même, suggèrent parfaitement la nature de l'infection(6) :

' Une des formes les plus benignes de ce mal se manifeste par l'apparition, en pleine santé, d'un ou deux vomissements, en général un seul vomissement, presque toujours alimentaire, expulsant le contenu pris au dernier repas ; après quelque intervalle ou même tout de suite après le vomissement, l'enfant devient apathique, somnolente, taciturne et en général prise d'une excessive torpeur cérébrale dont on ne réussit pas à la reveiller que difficilement et au dépens de manœuvres violentes comme les bains chauds, ventouses scarifiées derrière les oreilles et d'autres excitations, mais l'enfant ainsi reveillée tombe de nouveau dans le sommeil et retourne à sa phase habituelle de torpeur intellectuelle irresistible ; dans ces cas l'enfant, loin de présenter quelque contracture, la plus légère qu'elle soit, dans quelque membre ou région de son corps, se trouve plutôt dans un état de vraie résolution musculaire ; pouls accéléré, souvent très accéléré, 100 à 120 ou plus par minute ; respirations entre 20 à 30 ; rarement inégalité pupillaire ; et quelquefois l'abolition du reflexe plantaire ; presque toujours dilatation pupillaire ; il n'y a pas de trisme ; foie et rate sans congestion ni hypertrophie ; urines claires et abondantes ; constipation opiniâtre qui est la règle dans ces cas et ne cède ni aux purgatifs ni aux lavements, ceux-ci étant expulsés dans le même état de leur administration et malgré des fomentations constantes dans l'abdomen qui est tumefié, à cause du tympanisme ; sensibilité générale normale. De telles formes, qui sont presque toujours benignes et guérissent parfois spontanément, durent 24 ou 48 heures et rarement trois jours, sont souvent précédées, lorsque le vomissement manque, d'une ou deux selles liquides, muqueuses ou normales. On trouve des cas où l'estomac ne supporte

ou plusieurs vomissements (N et D), parfois il y a de la rigidite de la nuque et meme des membres, bien que tres legere dans quelques cas et des convulsions cloniques et toniques (N et D) pouls presque toujours accelére (N et D), dissociation du pouls et de la temperature, celui la n'etant pas sous la dependence de celle ci (N et D), vomissements brusques et sans nausées, alimentaires ou bilieux, presque toujours au debut, devenant parfois incoercibles pendant le cours de la maladie (N et D Dopt), parfois la diarrhee est le symptome initial (N et D), température variable, monte quelquefois brusquement, mais elle n'est pas constante et dans plusieurs cas elle peut etre normale ou sousnormale, surtout au premier et deuxieme jour la maladie pour monter les jours suivants ou meme manquer completement (N et D, Dopt), rechutes et recidives de plus en plus graves et virulentes (N et D, Dopt)

Sous le point de vue de formes cliniques l auteur montre les memes ressemblances entre la maladie qu'il etudie et l'infection meningococcique décrite par les classiques *forme hyperaigue* rare l'enfant sans conscience en delire et vive agitation mouvements incohérents des muscles de la figure, grimaces gestes desordonnés des membres, tremblements du corps pouls et respiration irreguliers incontinence des sphincters (N et D) *forme fulminante* que l on trouve au debut des epidémies et dans quelques cas sporadiques frappant les enfants en pleine et parfaite santé au milieu de leurs jeux et occupations ou pendant le sommeil (N et D), commençant par des vomissements qui portent a croire a une indigestion (N et D) stupeur profonde qui montre la gravite du cas (N et D) respiration penible, pouls petit irregulier souvent imperceptible de temps en temps des convulsions violentes et la mort survenant au bout de 4 a 8 heures le plus souvent apr s 10 a 30 heures (N et D) les malades mourant comme s ils etaient empoisonnes au dire de Tourdes (N et D) les formes attenuees et abortives sont tr s frequentes surtout lorsque la maladie manifeste une certaine recrudescence et frappent un grand nombre d'individus dans les localites ou sevit l epidémie, de la meme forme que les embarras gastriques accompagnent les epidemies typhiques (N et D) on pense à un embarras gastrique lorsque les troubles digestifs dominent (N et D), la meningite cerebro spinale du nourris on est tres frequente, extremement grave et d un diagnostic particulierement delicat (N et D), l enfant jouissant d'une excellente sante est pris de vomissements et ce qui domine ce n'est pas l'agitation mais la stupeur, l'enfant abattu, sommeillant pendant des heures, laissant tomber la tete sur l'épaule de la personne que la soutient, ayant quelquefois des sursauts qui interrompent la somnolence, donnant des crises d'agitation qui retombent de nouveau dans l'état antérieur (N et D, Dopt), dans cette forme la température est peu elevee et les troubles digestifs coexistent avec le malaise, l'enfant refusant nourriture et boisson et ayant des vomissements et diarrhee souvent profuse (N et D), des irregularites du pouls et de la respirations sont frequentes et le signe de Kernig est tout à fait rare et des plus difficiles à constater et la rigidité de la nuque qui est un signe d'importance capitale peut manquer, la contracture etant remplacee en quelques cas par la paresie des muscles de la nuque, tellement accentuée

dans certains quartiers, mais encore en certains domiciles et certaines familles dont les foyers montrent chaque année des cas de cette maladie ; l'extension de la maladie à une moitié, au moins, des maisons de sa circonscription ; l'évolution du mal indépendante de toutes les thérapeutiques jusque là employées par les soidisant spécialistes ; le non fondé de l'idée de lombricose puisque, sauf dans de rares cas, les petits malades ne jettent pas des parasites intestinaux ni au début, ni au cours, ni à la fin de la maladie, malgré tous les vermifuges que l'on emploie ; l'année dans laquelle il a vu des symptômes identiques et qui remonte peut être à 1909 et 1913, deux fils d'un confrère ayant alors succombé à cette symptômatologie classifiée par l'auteur de méningite sans pouvoir établir nettement sa nature, et, certainement à 1919.

En vue de ces symptômes cliniques l'auteur classifie la maladie comme méningite, non sans insister, comme l'ont d'ailleurs fait les classiques, que pour une meilleure explication des faits il vaudrait mieux de remplacer cette designation par celle de *infection méningococcique, méningococcie, septicémie méningococcique, méningococcémie*, en reservant le nom de *méningite cérébro-spinale* pour une des formes plus caractéristiques et electives de cette infection. Ensuite il montre les analogies de cette maladie avec les descriptions de Dopter(5) et Netter et Débré(6) ; son allure épidémiologique avec une extension et diffusion médiocre, la propagation s'étant faite par foyers limités et peu denses (N. et D.) ; devenant endémique et se revélant par des cas isolés, sporadiques (N. et D.) ; maladie d'hiver et printemps (Dopt.) qui dans cette province donne les premiers cas en Novembre et Décembre, augmentant en Janvier-Février, pour donner une épidemie en Mars et Avril, tombant ensuite, mais laissant des cas isolés qui établissent la liaison entre la fin d'une épidémie et le commencement de l'epidemie suivante (Dopt.) ; sa predilection spéciale pour les enfants qui lui payent en général le plus lourd tribut (N. et D.) ; sa coincidence avec les recrudescenses d'autres maladies infectieuses comme la grippe, pneumonie, oreillons (N. et D.) ; sa contagiosité familiale, domiciliaire et à distance par des porteurs, épargnant néanmoins les bourgs proches des foyers infectieux lorsque ceux-ci n'ont eu aucun rapport avec les malades (N. et D.) comme il arrive avec la population non chretienne d'Assolna et Cuncolim, contagiosité bien moins prononcée cependant que dans la plupart des maladies épidémiques (N. et D.) les cas de transmission étant relativement très rares (N. et D.), les cas isolés dans les familles et dans les domiciles constituant la grande majorité (N. et D.; Dopt.) ; incontestable transmission par des porteurs de germes (Dopt.) intermédiaires entre le foyers morbides, formant une véritable chaîne dont il est impossible de connaître chaque liaison (N. et D.).

Sous le point de vue de symptômatologie générale : début brusque, violent (N. et D.) ; en pleine santé l'enfant est pris d'un vomissement et malaise ; le début peut être fulminant, une crise convulsive constituant alors le premier accident manifeste : l'enfant donne un cri et entre en convulsions épileptiformes, généralisées par tout le corps, survenant alors la phase du coma (Dopt.; N. et D.) ; d'autres fois le début est apoplectiforme ou comateux, précédé ou accompagné d'un

TROISIEME ETAPE DANS L'HISTOIRE DE LA MENINGITE.

Pour mettre fin à ces doutes et confusions tellement contraires à la bonne execution des mesures sanitaires, le Gouvernement nomme le 10 Fevrier une commission mixte de médecins officiels et cliniciens libres pour étudier sur place les cas de la maladie en se secourant de toutes les ressources cliniques, bactério logiques, anatomopathologiques et proposer les mesures convenables pour combattre l'épidémie La commission est composée du Lieut Colonel Prof Germano Corrêa, président, Capt Prof Aires de Sa, cliniciens libres Vicente da Piedade Gracias, Gladstone da Costa, João Camilo Antão, J F de St Antonio Fernandes et José Jesus Gomes et Prof aggrégé Domingos Roque de Sousa, secretaire

Le premier cas observé par la Commission et traité comme malaria cerebrale est un cas typique d'une affection méningitique incontestable dont le sang ne montre pas de plasmodies, fait attribue à la quinine que les assistants injectent *larga manu* depuis le debut et que la ponction lombaire démontre être dû à un diplocoque Gram negatif que, quelques jours apres, les agglutinations specifiques avec des sérums monovalents à haut titre, faites dans mon laboratoire par le president de la commission identifient comme méningocoque type B[11] Je laisse la parole au Prof D R Souza qui a eu la gentillesse de me permettre insérer ici le rapport clinique de ce cas si interesant

Mereiano, 4 à 5 ans, fille de A Martins du quartier de Chandor, malade avec assistance médicale l assistant ayant ete présent à tous les examens faits par la commission

Histoire de la maladie—Toux seche et coryza ayant dure quelques jours mais bon état général Il y a 20 jours reveil brusque à minuit et vomissements d abord alimentaires, ensuite muqueux, se repetant constamment jusqu à midi du jour suivant Nombre de vomissements environ 15, sans nausees, ne conservant pas meme de l eau Une potion donnee par le médecin et des soudes arretent les vomissements, qui ne se repetent plus

Vers l après midi la petite malade a une soif irresistible, demandant de l eau avec avidité, faisant elle meme des efforts pour se trainer jusqu a la cruche d'eau qui était dans un coin de la chambre

Des le début, perte du tonus général—*etait devenue molle*, dit la mere '—et en la faisant asseoir au sein de la mere, glissait instinctivement et s'étendait sur le tapis qui lui servait de lit

La mere n'a pas remarqué ni cephalée ni lourdeur de tete, jugement parfait, l enfant demande toujours de l eau

Vers minuit du lendemain, convulsions cloniques plus ou moins généralisées, durant jusqu'au soir du jour suivant Convulsions fréquentes avec accalmies de ½ à 2 heures et souvent accompagnées de cris aigus Pendant les accalmies la tete avait perdu l equilibre tombant de tous les cotés, surtout par derrière La mere ne savait rien dire sur la rigidité de la nuque, mais une des personnes de l entourage ajoutait 'nous ne savons pas l expliquer, mais l etat de la tete et de la nuque est tel que vous le voyez maintenant' Pendant les convulsions rigidité générale pendant les accalmies, l enfant était molle, le corps ballant

Des les premières convulsions s installe le coma, l enfant, les yeux fermés, insensible à l'entourage sans parole, inconsciente Bonne déglutition ayant cependant eu pendant environ deux jours une, légère dysphagie Tympanisme qui a predominé toujours, constipation cédant aux lavements dont elle n a plus besoin pendant les derniers quatre jours Pas de diarrhee, à aucun moment de la maladie,

Apyrexie les premiers 2 jours, les 5 jours suivants fièvre du type remittent, oscillant entre 101 à 102 Fahr, ayant atteint meme 10[illegible] Ni frissions ni sueurs

Retention de l urine pendant les premieres trente heures et la famille insistait sur cette retention expliquant que l on sentait la vessie pleine et que l enfant avait uriné plus tard abondamment !

que l'enfant ne peut plus lever la tête pendente (N. et D.) ; de tels symptômes, en rélation avec les lésions intestinales presque constantes dans la méningite cérébro-spinale infantile font penser plutôt à un embarras gastrique ou à une entérite qu'à la méningite cérébro spinale, mais on ne devra jamais se contenter avec des diagnostics imprécis, tels que méningisme ou convulsions essentielles, ni on ne devra attribuer les accidents méningés observés à une irruption dentaire, à des vers intestinaux ou à une infection ou intoxication digestive et ce fait mérite qu'on le signale particulièrement puisque le diagnostic. le plus souvent posé dans ces cas, est celui de gastro-entérite, erreur banale et grave qui conduit à une thérapeutique désastreuse (N. et D.), un tel ensemble symptômatique étant de nature à orienter le clinicien plutôt vers une gastro-entérite que vers la méningite (Dopt.), ce qui portait Hutinel à dire dans une de ses leçons : chez tous les enfants atteints de ce mal, qu'est ce que vous constatez en général ? des troubles digestifs d'apparence anodyne, qui frapperont votre attention, cachant le véritable mal et déviant fréquemment le diagnostic (Dopt.).

On dirait que ces dernières lignes, écrites dans la capitale de la France le furent exprès pour ce petit pays d'outre mer.

L'auteur néanmoins remarque quelques différences entre la maladie de sa circonscription et la description des auteurs : le manque d'inflammation des muqueuses nasopharyngéennes précedant ou suivant l'infection, non sans ajouter que telles constatations sont difficiles surtout lorsqu'il s'agit d'enfants (on verra plus tard que telles localisations existent fréquemment) ; la durée de la maladie moindre que l'evolution générale de la méningite, non sans faire remarquer que les formes à longue évolution ne sont pas néanmoins entièrement absentes et attribuant ce fait au caractère septicémique dont la maladie se rêvet chez les enfants chez lesquels la septicémie méningococcique pure semble s'observer plus frequemment que chez les adultes (Dopt.). Il n'est pas d'ailleurs tout à fait inoui d'observer des cas chez lesquels l'amélioration se manifeste souvent très rapidement, suivie des guérison des malades qui peuvent passer brusquement d'un danger imminent à un rétablissement presque complet. (Tourdes cité par N. et D.)

En même temps le délégue de santé de Salsete, Dr. Sequeira Nazareth(7) soutenant la nature méningococcique de la maladie appelait l'attention non seulement sur sa marche épidémiologique envahissant lentement d'autres villages, au département, mais montrait que dans un cas, occurant le 24-II-1923, il y avait tous les signes classiques, rigidité de la nuque, Kernig, vomissements au début, trismus, convulsions et une eruption pétéchiale, un rash qui devrait être consideré comme une véritable purpura méningococcique.

Et la maladie continua à s'étendre à d'autres villages ! Aucune prophylaxie ! Aucune mésure ! Le nombre des décès pendant ces années est resumé dans le tableau I et reste certainement inférieur au nombre réel des victimes infantiles qui remplissent les cimetières et ensevelissent dans la profondeur de leur silence le secret de leur mort !

ans etant plus frequente chez des enfants de 4 à 5 ans Les adultes sont rarement attaques quelques cas ayant ete enregistres au début de l epidémie morbidité faible relativement au gros de la population mais considérant le nombre des enfants qui sont frappés l incidence absolue est haute la lethalite n'excedant pas 15 pour cent ou meme 10 pour cent si l on considere les formes frustes qui souvent echappent a la connaissance des cliniciens

La maladie attaque surtout les enfants du peuple mais n'épargne pas les classes élevées ni les sexes Les classes non chretiennes payent un faible tribut a la maladie

Début insidieux et lent contagiosité évidente mais irreguliere marche progressive serpigineuse souvent capricieuse avec recrudescences et accalmies saisonnières ayant donne a ce qu il semble une mortalite plus grande au debut Ces donnees epidémiologiques s encadrent parfaitement avec celles de la méningite cerébro spinale épidémique Il faut ajouter que la maladie pendant longtemps s'est localisee dans quelques villages au sud de Salsete

L observations personnelle de la sous commission ainsi que l enquete aupres des cliniciens montrent que l expression clinique de la maladie se résume a une triade qui par sa frequence peut etre classifiée comme fondamentale, constituée par

(*a*) *Vomissements* avec lourdeur de tete ou céphalée celle ci plus appréciable chez des enfants au dessus de 6 ans

(*b*) *Tympanisme* avec *constipation* précedée ou non de diarrhée initiale

(*c*) *Somnolence* qui, lorsqu'elle est profonde peut aller d un simple et [illegible] de stupeur jusqu au semicoma et coma complet

Chacun des élements basilaires de cette triade qui evolue en general en trois jours lorsque considere isolement represente un lieu commun dan [illegible] infantile et toute maladie peut donner lieu a de tels symptome [illegible] triade envisagee dans son ensemble comme une note dominante et [illegible]able, persistant intacte a travers les plus variés types cliniques et dan [illegible] dans tous les villages pendant toutes les années que cette ma[illegible] pour définir le type morbide En pathologie nerveuse telles [illegible] classifiees au moins comme des reactions méningées ou men[illegible] Il s'a[illegible] donc d'une maladie infectieuse dont la caractéristi[illegible] sont ces [illegible] actions méningées et dont le tableau devient comp[illegible] tr[illegible] fondamentale des convulsions assez frequente[illegible], [illegible] chez les enfants qui succombent

La Commission a eu en outre l occas[illegible] tion laisser de classifier comme [illegible] regnante et comme tel notifié par le [illegible] Kernig et Brudzinsky recherches [illegible] traités de sémiologie il y manq[illegible] nuque qui d ailleurs peut ma[illegible] La position en chien de fus[illegible]

Expulsion par la bouche et par l'anus plus d'une fois, d'Ascaris, 6 en tout.

Etat actuel.—Yeux semiouverts. Stupeur complète, mais pas de coma. Fonctions sensorielles atténuées mais non abolies: A' la palpation du corps pas de rigidité musculaire, mais une flaccidité générale. Pas de météorisme abdominal. Temp. 97, 3. Extrémités du corps froides. Foie, rate normaux. On sent le foie mou, sous les cotés nettement, mais le médecin assistant informe qu'il avait été dur et dépassait le rebord costal de deux travers de doigt. Région fessière gauche avec une eschare provenante d'une mauvaise application d'un vésicatoire.

Examinée en décubitus, arc cervico-dorso-lombaire évident, la tête en extension maxima, cette position étant trouvée toujours, surtout en faisant asseoir l'enfant et, même, lorsque la tête est ballante, c'est à la retroextension qu'elle revient !

Position en chien de fusil, mais chose curieuse, loin d'observer les rigidités que cette position faisait prevoir, les membres sont flasques, les muscles du dos sont flasques, flasque aussi la paroi abdominal : Seule à la base de la nuque on remarque une rigidité musculaire qui explique l'extension de la tête, rigidité qui devient prononcée et fait revenir la tête à la position antériéure, lorsqu'on fléchit par force la tête contre la poitrine. Brudzinsky de la nuque, Brudzinsky controlatéral nettement positifs. Kernig en position couchée, recherché selon la technique d'Osler, nettement positif. Kernig en position assise positif, l'enfant présentant dans cette position un rictus douloureux de la face et une tendance instinctive pour glisser et s'étendre en même temps que la tête retombe rapidement en arrière ; mais chose curieuse, il est possible, et sans difficulté, de faire l'extension des membres qui se fléchissent brusquement et systématiquement lorsque la main de l'expérimentateur ne s'y oppose pas. On remarque souvent pendant ces manœuvres des mouvements desordonnés des membres, ainsi que la flexion des orteils qui peut être facilement vaincue.

Constant mouvement de mâchonnement. Tremblement des doigts parfois.

Ulcère d'une des cornées. Ni photophobie ni inégalité pupillaire, ni strabisme. Reflexe oculo-palpébral conservé. Pas d'ottorrhée.

Raie de Trousseau recherchée plusieurs fois nettement positive. Bradycardie. Arythmie d'une étonnante regularité, une pause survenant après chaque trois pulsations.

Comme symptômes constants, après chaque manœuvre qui était faite avec toute la délicatesse que l'état de la petite malade et la pitié pour ses souffrances le permettaient : l'arc cervico-dorso-lombaire, rétro-extension de la tête et le rictus douloureux de la face.

Et un malade pareil continua à être traité comme un cas de malaria cérébrale, malgré l'absence de plasmodies à l'examen du sang, mise au compte des doses massives de quinine injectée, le traitement spécifique suggéré et offert par la Commission étant refusé malgré la constatation du méningocoque dans son liquide céphalorachidien hémorragique ! ! !

La Commission parcourt plusieurs villages infectés, étudie les cas cliniquement, rejette successivement les hypothèses de *toxémie alimentaire, verminose, malarienne, infection gastro-intestinale* et *grippe* après une etude consciencieuse clinique et laboratoriale qui demontre le non fondé et l'inviabilité de telles génèses et conclue que la maladie regnante est la méningite cérébro-spinale épidémique !

Le rapport de la Commission n'est pas encore publié, mais dans le journal officiel(8) on trouve le procès verbal de ses travaux qui a servi de base pour l'arreté qui a commencé la campagne prophylactique. Un resumé de ce procès verbal mérite pour tous les motifs que l'on exare dans ce repport :

(*a*) la sous commission clinique composée des MM V. da Piedade Gracias, G. da Costa, J. F. St. Antonio Fernandes, J. N. Gomes et Prof. ag. D. R. Souza constate :

Il s'agit d'une maladie manifestée au début par des cas sporadiques, devenant en suite endémique, plus tard épidémique, étant actuellement endémo-épidémique.

Elle est contagieuse, mais sa diffusion n'est pas aussi grande que celle de la grippe ; elle frappe de préférence les enfants et jeunes gens, de quelque mois à 16

de méningite, surtout après que tout recémment un nouveau cas typique, découvert par le clinicien F Barreto au village de Vaica réussit à convaincre les plus sceptiques, à la face de la clinique et de l'examen bactérioscopique fait par l'analyste L Coutinho de l Hospice de Margão décelant des diplocoques intra et extracellulaires dans le liquide céphalo rachidien hémmorragique, découlent quelques conclusions intéressantes en ce qui concerne la symptomatologie de la méningite infantile

(*a*) d'abord on trouve de rares cas typiques, avec tous les signes classiques, mais, même dans ceux-ci, la note dominante est constituée par les contractures flasques, qui ont fait une si grande confusion dans l'esprit des cliniciens de ces villages

(*b*) la plupart des cas, plus ou moins graves, évoluant rapidement se caractérisent par une *triade fondamentale* (vomissements dont le caractere en fusée est des plus nets, *tympanisme abdominal* avec constipation , *somnolence*) et *une triade accesoire* (résolution musculaire en *contracture flasque*, *convulsions*, *fievre* apparaissant en général vers le second ou troisième jour de la maladie)

(*c*) l'extraordinaire abondance des formes frustes, qui non seulement ont contribué pour la non acceptation du diagnostic mais surtout à faire endémiser et propager la maladie

PROPHYLAXIE ACTUELLE.

Premiere phase —Trois jours apres que la Commission eût rédige le proces verbal et immédiatement à suivre l'identification d'un des diplocoques isoles de ces cultures j'entreprenais, investi maintenant dans mes nouvelles fonctions, une active campagne antiméningitique Il s'agissait tout d'abord de mettre fin a la phase épidémique qui ravageait les villages et ménaçait d'envahir d'autres departements Les principes qui me guideient étaient les mêmes employés en 1921, mais cette fois avec l'autorité provenante d'un arreté du Gouvernement, avec la plus obligeante et entiere coparticipation de l'Assemblée législative Le texte de ce diplôme mérite d'être connu, par la franchise et absolue sincerité scientifique qui y transparait(9)

' Considérant qu'une maladie endémo épidémique sévit depuis plusieurs années dans le département de Salsete

' Considerant que, localisée primitivement au sud de Salsete, ses irruptions épidémiques s'étendent actuellement par tout ce département et menacent d'envahir les départements limitrophes où l'on a déja enregistré des cas du même mal ;

' Considérant que la même maladie attaque de préférence des enfants et contribue puissamment pour augmenter la mortalité infantile dans [illegible], puisque entre 1921 à 26, par conséquent dans une période de 5 ans [illegible] des [illegible] 1000 le nombre des enfants qui à Salsete ont succombé à cause de ce mal ;

' Considérant que la Commission des médecins [illegible] Pro[illegible] No 79 du 10 Février, 1927, puisant des éléments [illegible]

l'arc cervico-dorso-lombaire à concavité postérieure contrastaient aussi avec la flaccidité musculaire générale.

L'enquête auprès des cliniciens a aussi démontré l'existence des cas typiques, malgré que rares, de méningite, les uns avec les signes de Kernig et Brudzinsky positifs avec des contractures durables ou transitoires, nettes ou à peine ébauchées indiquant tout au moins une evidente repercussion méningéenne.

La sous Commission a verifié dans quelques autres cas plusieurs signes tels que cri hydrencéphalique, soif violente, hyperesthésie cutanée, retention de l'urine, congestion des conjonctives, mouvements convulsifs des paupières, strabisme, photophobie, tachycardie, bradycardie, arythmies, dilatation pupillaire, mouvements convulsifs des lévres et des maxillaires que les auteurs français appellent mâchonnement, grincement des dents, mouvement de suction des lèvres, polypnée *sine-materia*, Cheyne Stokes. Deux cas à peine de sequelles tardives, l'un avec paralysie du voile du palais et l'autre avec perte de l'equilibre de la tête qui subsistait un mois encore après la guérison.

Les ponction lombaires donnent pour la plupart des liquides clairs, mais on trouve évidemment des liquides hémorragiques, purulents ou simplement troubles.

Une autopsie faite par la Commission a montré une intense et extrêmement anormale vascularisation des méninges et de l'encéphale, avec adhérences de la dure-mère à la calotte cranéenne et pointillé hémorragique à la base.

La Sous Commission chargée des travaux de laboratoire constate qu'aucun des malades qu'elle a examinés n'a montré des plasmodies dans le sang, ajoutant que la formule hémoleucocytaire n'était non plus de façon à suggerér l'infection paludéenne. Les numérations des globules rouges ont donné des chiffres normaux ou quasi normaux ; celles des globules blancs ont été toutes supérieures aux chiffres normaux atteignant dans un cas 12700. L'examen chimique et bactériologique des urines n'a montré aucun élément digne de remarque, celui d'un vomissement rien non plus ; l'examen des selles a donné ici et là des œufs d'Ascaris, Tricocéphales, tœniades, quelques ankylostomes, rarissimes oxyures, quelques flagellés. Les coprocultures n'ont donné aucun germe entero infectieux connu.

Entretemps les examens bactérioscopiques de 5 liquides cephalorachidiens, négatifs sous le point de vue de tuberculose, ont montré des diplocoques, qui cultivés sur des milieux appropriés et traités par des agglutinations spécifiques se sont montrés appartenir au type B. Les cultures des secrétion des rhino-pharynx dûment faites, ont aussi réussi à isoler dans 2 cas des méningocoques du même type, l'enquête bactériologique concernant des enfants de 6 ou 7 villages différents et non des malades d'un seul foyer.

Ceci posé, la Commission affirme unanimement que la maladie regnante appartient à l'infection meningococcique, vulgairement dénommée *Méningite cérébro-spinale épidémique*.

De l'étude faite par la Commission, par moi-même (en 1921) et par les deux autres confrères deja cités, études qui reçoivent chaque jour de nouvelles confirmations de la part des cliniciens, presque tous ralliés à l'heure actuelle au diagnostic

Art° 4 Tout médecin appelé à secourir un cas de cette nature devra immédiatement s informer de l accomplissement des dispositions de l article antecédent et si le precepte de cette notification n'aura point éte observé, le medecin devra le faire selon les règles établies dans ce diplome et avec son opinion sur l apparente évidence de la maladie

Chapitre II

Isolement du malade

Art° 5 En cas d occurence d un cas suspecte ou confirme le malade sera sur le champ isolé dans le domicile meme en chambre spéciale voue aux soins d un minimum de personnel adulte indispensable deux personnes tout au plus et il sera convenable que l on écarte immédiatement et meme avant la visite sanitaire tous les autres membres de la famille surtout les enfants

§ unique Dans quelques cas restreints l autorite sanitaire pourra permettre qu une ou deux personnes de plus puissent faire l assistance au malade

Art° 6 L autorité sanitaire ou son délegue visitera dans le plus court délai le malade dont la notification lui aura ete faite et vérifiera si le malade est dument isolé communiquera au cas contraire et immédiatement le fait à l autorite administrative ou policiale pour les effets de ce diplome et ordonnera l isolement dans les conditions nécessaires ou le fera suspendre si la suspicion de la maladie ne se confirme point

Art° 7 S il s agit d un malade pauvre qui ne possède point des appartements pour que l isolement s accomplisse l autorite sanitaire reglera selon les circonstances de l occasion d accord avec l autorité administrative ou policiale

Chapitre III

Traitement du malade et de l entourage

Art° 8 L individu atteint par la maladie aura l assistance médicale de l autorité sanitaire ou de son délegue toutes les fois que l assistance médicale particulière lui manque et au cas que la famille ne s oppose pas à ce que cette assistance lui soit rendue par les autorités officielles

Art° 9 Une certaine quantité de sérum antiméningococcique polyvalent sera mise à la disposition des équipes antimeningitiques afin qu il puisse etre employé ou fourni à titre gracieux aux pauvres s il y en a demande et la certitude d etre employé par voies intrarachideenne ou au moins intraveineuse

§ unique A ceux qui ne soient pas pauvres le sérum sera vendu par le prix de revient

Art° 10 Lorsque l autorité sanitaire confirme la suspicion d une occurence [illegible]ique, les habitants du domicile respectif seront inscrits en enregistrement qui devra s e[illegible] aux autres personnes qui aient été en contacte avec le malade les convalescents ou les [illegible] porteurs de germes qu ils demeurent ou non dans la maison infectée qu ils appartiennent [illegible] à la famille du malade, l autorité sanitaire devant regler sa conduite pour ce but selon les probabilités du contage et de la véhiculation des germes infectants

§ 1 Etant impossible de fixer avec précision les probabilités de [illegible] l'execution cet enregistrement dependra du criterium de la personne chargée de ce [illegible] dans la respective zone

§ 2 L enregistrement pourra s étendre à un plus grand [illegible] des maisons du quartier meme à tout un quartier, si l épidémie se manifeste par des cas [illegible] dans la zone

Art° 11 Pour les buts de cet enregistrement le chef de famille ou ceux qui le remplace [illegible] à declarer les noms de toutes les personnes residant dans le domicile et de ceux qui, etan[illegible] ont été en contacte avec le malade dans les derniers [illegible]

Art° 12 Toutes les personnes enregistrees sont [illegible] a se soumettre a la desinfe[illegible] rhino pharynx par des moyens appropriés et [illegible] l'autorité [illegible] convenable

et épidémiologiques put affirmer par une façon inéquivoque, qu'il s'agissait d'une maladie infecto contagieuse et épidémique qui, à travers des plus variées modalités symptomatologiques qui lui fut donné d'observer, montrait d'indiscutibles repercussions méningées ou méningo encéphaliques de nature non grippale ;

'Considérant que les recherches bactérioscopiques, parasitologiques et chimiques faites par la même Commission-négatives sous tous les autres rapports (malaria, verminose, grippe, acidose, etc.), ont démontré dans tous les liquides céphalorachidiens qu'elle put recolter, l'existence d'un diplocoque appartenant à la famille des meningocoques ;

'Considérant que le diplocoque isolé d'un de ces liquides fut démontré appartenir au type B ;

'Considérant qu'en vue de ces éléments cliniques, épidémiologiques anatomopathologiques et bactériologiques, il serait un crime de différer pour plus longtemps l'execution des mesures tendantes à combattre la marche si étendue et si insidieusement envahissante de la méningococcémie cérébro-spinale épidémique, en attendant que l'identification des agents fût faite en chaque cas, car, comme le montrent plusieurs épidémies semblables, modernement étudiées, il peut se faire que dans une même épidémie l'agent varie d'un individu à l'autre, peuvant même coexister avec d'autres agents méningitogènes alliés (pneumocoques, streptocoques, etc.) ;

'Considérant que la méningite cérébro spinale épidémique une fois installée dans un territoire est. soit par la nature des agents vecteurs du contage, soit par la difficulté d'atteindre le germe infectant dans ses localisations primaires, de difficile extinction comme le démontrent toutes les épidémies du monde, devenant ainsi urgent d'essayer de combattre le mal dans ses foyers primaires et d'éviter surtout sa dissémination par les circonscriptions indemnes ;

'Vues les conclusions de l'enquête de la Commission nommée par l'Arr. Prov. No. 79 du 19 Février ;

'Le Gouverneur General de l'Etat de Inde, sous proposition du Directeur du Service de Santé et Hygiène et avec le vœu déliberatif du Conseil du Gouvernement qui en séance de cette date, considéra urgent le sujet, determine le suivant':

Chapitre I.

Notification de la maladie.

Art° 1. Tout cas de méningite confirmé ou suspect sera notifié, dans le delai de 24 heures à compter de son occurrence, au délégué ou sous delegué de santé ou à l'autorité administrative locale, la quelle, par la voie la plus rapide, en fera part au délégué de Santé ou à l'autorité sanitaire de la respective zone ou circonscription.

Art° 2. Pour les effets de cette loi on considère cas suspect, en s'agissant d'enfants ou d'individus jusqu'à 18 ans, celui qui aura isolément ou concomitantement quelques uns des suivants symptômes : vomissements, somnolence, convulsions.

Art° 3. Cette notification doit être obligatoirement faite par le chef de famille et en son absence par celui, qui étant à ce temps dans le domicile, le remplacera.

6 Inhalations humides

Iode métallique	6 à 12 gr
Guaiacol	2
Acide thymique	0 25
Alcool à 60°	200

Un vase avec de l eau et quelques gouttes de ce mélange sera laissé dans une bouillotte avec eau chaude Aspirer les vapeurs par un tube ou un cone en carton en l adaptant aux orifices nasal et buccal

Repéter pendant 4 à 5 fois durant 3 minutes chaque fois

Art° 21 La Direction du Service de Sante et Hygiène organisera des inspections periodiques pour le bon fonctionnement de la campagne antimeningitique et pour y introduire des altérations que la pratique conseillera comme les plus convenables pour une rapide extinction de l epidémie

Art° 22 Les autorites administratives ordonneront aux *regedorias* (autorité administrative du village) que la plus grande publicite soit donnee à ce diplome, par la forme la plus convenable et de façon que personne ne puisse alléguer l ignorance de la presente loi

Chapitre IX

Mésures spéciales pour les départements de Salcete et Mormugao

Art° 23 Les departements de Salcete et Mormugao sont divisés en trois circonscriptions correspondentes aux respectives circonscriptions sanitaires

Art° 24 Dans chaque circonscription sera employé au service de l épidémie le personnel suivant

1 médecin—délegué spécial directeur des services

Le délegué de santé respectif

1 médecin adjoint

1 infirmier de premiere ou seconde classe

6 aides d infirmièrs

Art° 25 Les divers services de verification de la maladie effectivation de l isolement prophylaxie individuelle et des endroits poste permanent de désinfection pour les individus enregistres qui désirent s absenter de l endroit etc , seront destribues de façon utile profitable et équitative et en vue d obtenir le meilleur resultat

§ unique Le médecin qui dirige les services donnera au public par des avis auxquels les autorités administratives locales donneront large publicite connaissance des zones infectées du plan à executer et des locaux où l on fera en faisant toute attention à ce que l on donne au peuple toutes les facilites pour le libre emploi de leurs journees

Art° 26 Le délegué special donnera chaque jour un rapport resumé du travail execute par lui meme ainsi que par les médecins et d autre personnel à ses ordres et informera sur la possibilite de dispenser les services de quelques-uns des membres de l équipe afin que ce personnel puisse etre congedié ou employe ailleurs en cas de besoin

Art° 27 Le delegue de sante de la circonscription respective est inamovible

Art° 28 Au cas que dans une circonscription travaille plus d un delegue special la direction sera prise par le plus grade

§ unique En égalite de circonstances et s agissant de médecins pris par contrat on considere plus grade celui formé par les Facultés de la Métropole ou le plus agé entre ceux formés par l Ecole de Medecine et de Chirurgie de Nova Goa

Art° 29 Le délegué spécial pourra accepter les services volontaires de tout clinicien de la localité étant neanmoins le directe responsable pour l éxecution des memes services

Art° 30 Le Commandement de la Police détachera pour le service de l épidémie 3 équipes pour les trois circonscriptions sanitaires aux ordres du delegue special respectif, composées chacune d un sergent 3 caporaux ou soldats sachant lire et ecrire et 6 soldats, possiblement cyclistes.

Art° 13. La désinfection préconisée dans l'article antérieur pourra s'étendre à d'autres personnes ou familles de l'entourage surtout s'il s'agit de quartiers populeux et à habitations compactes et si l'on soupçonne que d'autres cas de maladie ont eu lieu dans le même quartier.

$ unique. Seule, l'autorité sanitaire est compétente pour determiner l'aire, ainsi que le nombre des familles auxquelles semblables desinfections doivent s'appliquer.

Art° 14. Le malade, lorsque guéri, continuera à être isolé pendant 20 jours, l'isolement devant cesser au bout de 10 jours au cas que le malade ait été traité par le sérum spécifique employé par voie intrarachidéenne.

Art° 15. Dans aucun cas un convalescent de méningite pourra fréquenter école, temple ou toute localité ou il y ait des réunions ou des agglomérations humaines, sans que, au moins, vingt jours découlent après la fin de la maladie et que le rhino-pharynx du malade ait été désinfecté autant de fois que l'autorité sanitaire indiquera, les desinfections étant faites par du personnel officiel dûment entraîné ou par des médecins privés méritant de la confiance de l'autorité chargée de la respective zone et sous la directe responsibilité de la même autorité.

$ unique. Le délai de 20 jours sera réduit à 10 au cas que le malade ait été traité par du sérum antiméningococcique par voie intrarachidéenne.

Art° 16. Pendant la maladie l'autorité sanitaire désinfectera rigoureusement et par des moyens appropriés les effets des malades ainsi que les pavés et les chambres infectées et, la maladie terminée, on fera une désinfection générale du domicile, même par la flamme du foin, au cas que l'autorité sanitaire le juge nécessaire (maisons obscures et humides ; persistence de l'endémie dans une aire à habitations compactes, etc.).

Art° 17. Pour les buts de ce diplôme tout cas de récidive ou rechute, ainsi que tout cas nouveau qui se manifeste dans le même domicile sera considéré comme une occurrence nouvelle.

Art° 18. Les cortèges solemnels en cas de décès de méningite sont défendus.

$ unique. Le cadavre sera enveloppé en linceuil imbibé de liquides antiseptiques indiqués par l'autorité sanitaire et enseveli dans le plus bref délai.

Art° 19. L'équipe antiméningitique fera dans la zone infectée ou suspecte d'infection des inspections domiciliaires afin de découvrir des cas de maladie.

Art° 20. La désinfection des rhino-pharynx sera faite par du personnel dûment habilité employant isolément ou concomitantement les suivants procès en applications topiques :

(*a*) *Chez les enfants.*

1. Huile goménolée à 10 pour cent.

2. Inhalations de chlorétone ou autre desinfectant volatile au moyens des inhalateurs ou nébulisateurs.

(*b*) *Chez les adolescents et adultes.*

1.	Résorcine	0.5
	Huile goménolée à 20 pour cent	80 gr.
2.	Résorcine	0.25
	Eucalyptol	2 gr.
	Vaséline	25 „
3.	Glycérine iodée à 3 pour cent.	
4.	Inhalations de vapeurs.	
	Menthol	5 gr.
	Eucalyptol	10 „
	Résorcine	20 „
	Guaiacol	25 „

Jetter une cuillerée à café dans un vase métallique ou en porcelaine, qui sera rechauffé à la flamme ; aspirer les vapeurs emises pendant 2 à 3 minutes.

5. Gargarismes de goménol à 5 p. 1000 ou de l'eau oxygenée à 1 p. 5.

Art° 44 Les parents ou tuteurs sont responsables pour le payement des amendes infligées aux enfants

Art° 45 La Direction des Services de Sante et Hygiéne publiera dans le Bull Officiel des rapports mensuels indiquant la marche de l épidemie et les resultats obtenus par la campagne anti meningitique

Art° 46 Les dispositions de ce diplome continueront en vigueur jusqu à ce que l on declare officiellement extincte ou jugulee l épidémie de la meningite cérébro spinale

Art° 47 Pendant cette épidémie les dispositions concernant la méningite contenues dans le Dipl Legislatif Provinciel no° 256 du 6 Mars 1927 sont remplacées par le present diplome

CHAPITRE VII

Payement du personnel employé dans la campagne antiméningitique

Art° 48 Les médecins et infirmiers officiels seront payés selon la legislation en vigueur en temps d épidémie déclarée

Art 49 Le personnel contracte aura les payements suivants

Délegué special	450 Roupies mensuelles
Delegué de sante	35"y compris son payement habituel
Médecin adjoint	350 Roupies
Aide d infirmier	60

Art° 50 Le personnel appartenat à la Police aura le double de son salaire

Art 51 Dans les termes du No 18 de l article 74 de la carte Organique un credit de 10 000 Roupies est destine pour faire face aux premières dépenses resultantes de ce diplome (7 III 1927)

* * * *

Le travail effectue par ces equipes anti méningitiques est resumé dans le tableau a suivre (Tableau II)

L'épisode epidemique fut jugule rapidement et l épidemie fut déclaree extincte le 6 Juin, 1927 Fruit du hasard, remission saisonniere ? Il ne le semble pas, puisque le chef de l'équipe travaillant a Cortalim et Quelossim Dr V A de Rego, dont le premier des villages, apres une patiente propagande acceptait déjà les mésures tandis que l autre s'y dérobait systématiquement pendant longtemps eut l'occasion de reunir des élements qui ont la valeur dune vraie expérience de controle(9) l epidémie de Cortalim ayant commencé par des formes severes et a diffusion rapide fait une chute brusque lorsque l hostilité populaire vaincue, les mésures prophylactiques ont eu pleine execution Quelossim cependant donne la contrepreuve et ici, la courbe nosologique monte dans la premiere semaine de Mai, lorsqu'elle etait en pleine déclinaison à Cortalim tombant aussi ensuite et pouvant se juxtaposer parfaitement a l'intensité de l'éxecution des mésures prophylactiques

Néanmoins dans mon rapport(10) je faisais les previsions suivantes lere récrudescence en Juillet Août, 2nde recrudescence en Novembre Décembre Et je concluais le rapport en disant que la maladie est *endemique dans le département de Salcete*

Ces affirmations étaient faites, d'abord par l étude des epidémies de méningite apparues dans les autres coins du monde ou les resultats de cette lutte prophylactique ont souvent été des plus decevants, sécondement parce que le méningocoque est

Art° 31. L'autorité administrative du Département ou du village fournira au personnel des équipes les moyens de transport ainsi que des ouvriers et du matériel requis pour le plein accomplissement de leur tâche.

CHAPITRE V.

Mésures dans les autres Départements.

Art° 32. Au quai d' Agaçaim ou à celui de Cortalim, selon les bésoins, on installera un poste prophylactique antiméningitique destiné à soumettre au respectif traitement tous les passagers qui de Salcete s'addressent vers ces endroits.

Art° 33. Ce poste sera dirigé par un infirmier et restera sous la superintendence du délegué de santé respectif.

$ unique. On pourra isenter de l'application du traitement les personnes dont les déclarations, disant qu'elles ne viennent pas d'une zone infectée, qu'elles n'ont fait que traverser Salcete sans s'arreter auprès de quelque suspect ou qu'elles sont forcées de traverser constamment la rivière, d'un coté à l'autre, sans arrêt dans les localités infectées, méritent confiance.

Art° 34. Des postes identiques seront installées opportunément en d'autres localités, en cas de besoin.

Art° 35. Si un cas de maladie est découvert, le délegué de santé, après avoir agi selon les termes de cette loi, fera immédiatement une rigoureuse enquête en ordre à savoir l'origine de ce cas et les liaisons d'interdépendence qu'il puisse avoir avec les porteurs de germes sains ou convalescents de la localité ou d'autre endroit, afin que le traitement prophylactique soit appliqué à tous les individus de sa circonscription, presumés porteurs du contage, et fera part aux médecins chefs des zones des départements de Salcete et Mormugão de l'enquête qui aux habitants de ces zones soit concernente.

$ unique. Le délegué de santé demandera à la Direction des Services de Santé et Hygiène le personnel éventuel nécessaire pour ce but.

Art° 36. Dans les départements où des cas confirmés ou suspectes de cette maladie ont deja été enregistrés mais qui actuellement s'en trouvent indemnes, ou dans les endroits de Salcete ou Mormugão où on ne voit plus, pendant 30 jours, aucun cas suspect ou confirmé de méningite, la Direction des Services de Santé et Hygiène enverra un médecin du cadre de santé pour faire le dépistage des meningocoques par des recherches bactériologiques.

Art° 37. Aucun individu des endroits dont il s'agit dans l'article précedent ne pourra se soustraire à cette recherche, le service respectif devant être fait de soleil à soleil.

CHAPITRE VI.

Pénalités.

Art° 38. Celui qui n'accomplira point les dispositions contenues dans les articles 3,5,11,12,13,18 et 37 et leurs paragraphes sera puni avec une amende de 5 à 50 Roupies et en cas de reincidence avec le double de l'amende infligée antérieurement.

Art° 39. Le médecin assistant que ne fera pas la notification dont il s'agit dans l'article 4 sera puni avec une amende de 25 à 100 Roupies.

Art° 40. Celui qui ostensivement s'opposera à l'accomplissement des dispositions contenues dans les articles 5,14,15,19,37 sera puni avec une amende de 25 à 100 Roupies.

Art° 41° Celui que l'on provera avoir donné de fausses declarations pour se soustraire aux dispositions de l'article 33 sera puni avec prison correctionnelle de 15 à 30 jours.

Art° 42. Les amendes seront infligées par l'autorité administrative ou policiale et si non payées volontairement dans le délai de 8 jours à compter de la notification, seront prises en procès de police correctionnelle, le procès verbal dressé par les susdites autorités étant valable comme corps de délit.

Art° 43° Les amendes seront substituées par prison, d'après les régles générales du droit, toutes les fois que l'on vérifie que le délinquent est pauvre et ne peut point payer l'amende.

On verra bientôt par la mesure du pouvoir agglutinant avant et après la vaccination les résultats de la méthode Pour le moment on s'est efforcé de montrer l'innocuité de l'opération trois enfants à Navelim, 6 à Chandor, 14 à Varcà, 25 à Chinchinim (cliniques des Drs A Colaço, J Gomes, J M Furtado et F Barreto) ont été vaccinés sans d'autres réactions qu'une légère douleur locale et chez six une légère exacerbation febrile n'ayant duré que quelques heures

Dans un pays où la vaccination anti-variolique rencontre tant d'obstacles on comprend ce que ces premiers essais de vaccination antiméningitique représentent de vraies conquêtes sanitaires Quel sera leur resultat ? L'avenir le dira, mais une affirmation a besoin d'être faite aucune campagne sanitaire ne peut être portée à bout sans la coopération populaire Si cela est un axiome dans toutes les maladies infectieuses, c'est davantage en s'agissant de la méningite cerébro spinale épidémique, surtout lorsqu'elle passe à la population civile et s'étend, comme la notre, à une aire comprenant environ 200,000 habitants !

Ce rapport a été tr s long ! Mais j'ai cru devoir le rédiger en détail parce qu'il contient des points de pathologie, de clinique et de l'épidemiologie qui me semblent avoir un extraordinaire interêt pour ce chapitre de la Pathologie Interne, et tout particulierement de la Pathologie infantile

INDEX BIBLIOG APHIQUE

(1) FROILANO DE MELLO (1921) Une épidémie de méningite cérébro spinale dans l Inde Portugaise, *Bull de Soc de Path Exot*, no° 7

(2) GELASIO LOBO (1924) . Subsidios para o estudo da epidemia de méningite cerébro espinal na area sanitaria de Betul, compreendendo um relatorio sumário dos trabalhos executados entre 30 de Março a 25 de Abril de 1921 *Bol Geral de Med e Farmacia (Nova Goa)*, no° especial Tip Rangel —Bastorà

(3) GERMANO CORREIA . *Bulletin d'analyse* ibid pag XXXVIII

(4) DOPTER (1921) .. L'infection Méningococcique, Paris Librairie, J B Baillière et Fils

(5) NETTER ET DEBRE . La méningite cerébro spinale

(6) WISEMAN PINTO (1924) . .. Notas clinicas sobre uma molestia endémo epidemica grassando desde ha alguns anos na àrea da Delegacia do Saude de Velim *Bol Ger de Med e Farm* no esp

(7) SIQUEIRA NAZARETH . Algumas considerações sobre a méningite cérébro espinal Apendice ao *Bol Ger de Med. e Farm* no° 1 IV serie

(8) Acta de Conclusão dos trabalhos da Comissão Médica nomeada por Port Prov no° 79, de 10 de Fevereiro de 1927 in Bol Oficial do Governo da India, in Arquivos da Escola Médico Cirurgica de Nova Goa, Série B Fasc I– 1927

(9) Diploma Legislativo Provincial no° 258 in Bol Of do Governo da India no° 19, 8, Março de 1927, in Arquiv da Esc Med Cirur de Nova Goa, Serie B Fasc I

(10) Relatório sobre a méningite da Provincia de Salcete referido ao periodo de d us meses, decorridos entre 9 de Março a 10 de Maio de 1927 in Bol Of do Governo da India, no° 55 de 14-7-927.— (Suplemento), in Arquivos da Escola Medico-Cirurgica de Nova Goa, Serie B Fasc I.

actuellement un hôte assez commun dans les gorges de ces habitants, et les recherches faites par le Capt. Prof. V. Dias ont montré que, comme partout ailleurs, il y a des cas où les nébulisations les plus consciencieuses, tout en déminuant le nombre des colonies obtenues par culture, ne parviennent pas à tuer le méningocoque (c'est le moment de dire que la plupart des cultures ayant donné le type B, on a cependant enregistré deux fois le type A) ; en troisième lieu comme pendant les mois Juillet-Août et Novembre-Décembre, augmente dans cette colonie la grippe, dont le virus a une localisation primaire semblable à celle du méningocoque, on devait atteindre que les causes metéorologiques ou autres qui augmentent la grippe auraient aussi un fâcheux retentissement sur la recrudescence des méningites ; enfin si dans les pays, où il y a une franche collaboration populaire, on a enregistré des résultats décevants, autant ne pourrait être jamais attendu dans cette Province où nous luttons avec une désolante hostilité de la part d'une grande majorité du peuple, née certainement, comme partout ailleurs, de l'ignorance qui conduit à la resistance passive, la pire des resistances que je n'aie jamais trouvée dans les campagnes sanitaires à ajouter à la difficulté de faire des désinfections des gorges chez les enfants de bas âge, même par les nébulisateurs, les seuls appareils qu'elles consentent sans repugnance..

Les cas sporadiques occurrant pendant le 8 Juin, 1927, jusqu'à 19 Juillet, 1927, sont inclus dans le tableau à suivre. Dans chaque cas on prenait les mesures antérieures. En même temps on dressait une carte topographique des rhinopharingites et amygdalites dans les villages infectés, pour les soummetre à des traitements spécialisés par des méthodes employées en otorhinolaryngologie, le Lieut.-Col. Prof. Germano Corrêa, qui cultive cete spécialité, ayant pris à sa charge d'instruire dans cette pratique les trois délégués de santé des circonscriptions atteintes.

Prophylaxie—Seconde Phase.—Mais la recrudescence commence, assez grave, cette fois et le Service de Santé prend la résolution de faire :

(*a*) Continuer le système de prophylaxie chimique selon les principes établis antérieurement mais comptant surtout avec la collaboration du peuple. L'isolement s'est montré impraticable en vue de l'étendue de la zone infectée et du manque de coopération populaire ;

(*b*) Demander au peuple de faire une prophylaxie domiciliaire privée employant les inhalations iodo-gaiacol-thymolées pendant 20 jours, cinq fois par jour et trois minutes chaque fois, outre les nébulisations, etc., qui seront faites par le personnel sanitaire ;

(*c*) Commencer á traiter par des cauterisations spéciales toutes les amygdalites et rhino-pharyngites par des méthodes employées en otorhinolaryngologie ;

(*d*) Faire la vaccination antiméningitique en trois séances hebdomadaires pour chaque vacciné, et en faisant preceder la première injection de 5 jours de nébulisation à chlorétone, suivie de spray nasopharyngéen du sérum antiméningococcique polyvalent.

TABLEAU I—*suite*

	1922												
	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	TOTAL.
Meningite cérébro spinale	9	3	2	2	2		1	6	8	2	3	3	41
Gastro entérite toxique									2		3	1	6
Congestion cerebrale	1			1					2	1		1	6
Fievre avec convulsions							1						1
Vomissements et convulsions													
Tetanos													
Malaria cerebrale				1									1
Fievre pernicieuse et convulsions	1									1		1	3
Convulsions						1			1		2		4
Entérite chronique	1	2		1		1	1						6
Gastrite aigue	1	1	1										3
Intoxication													
Fievre haute (cérébrale)						1			1				2
SOMME	13	6	3	5	2	3	3	6	14	4	8	6	73

TABLEAU I.

Mortalité infantile causée par la méningite cérébro-spinale parmi les enfants de 2 à 18 ans pendant la periode quiva de l'Avril 1921 jusqu'à 10 Mars 1927, diagnostiquée par les cliniciens sous des étiquettes variées.

	1921									
	Avril.	Mai.	Juin.	Juillet.	Août.	Septembre.	Octobre.	Novembre.	Décembre.	TOTAL.
Méningite cérébro-spinale ..	34	24	6	1	..	5	12	13	9	104
Gastro-entérite toxique ..	3	2	..	..	..	3	1	..	1	10
Congestion cérébrale ..	2	1	1	..	1	5	1	..	..	11
Fièvre avec convulsions ..	1	..	..	..	..	..	..	..	..	1
Vomissements et convulsions ..	1	..	..	..	1	..	..	..	..	2
Tetanos	..	..	..	..	1	..	..	..	..	1
Malaria cérébrale	1	..	..	1	..	1	..	..	..	3
Fièvre pernicieuse et convulsions	3	..	..	..	3	..	..	..	3	9
Convulsions	1	1	3	2	2	1	2	3	1	16
Entérite chronique ..	2	..	..	1	1	..	1	1	..	6
Gastrite aigue	..	..	..	..	..	..	..	..	..	..
Intoxication	..	..	..	..	..	..	..	..	..	..
Fièvre haute (cérébrale) ..	..	..	..	..	..	..	..	..	..	..
SOMME ..	48	28	10	5	9	15	17	17	14	163

TABLEAU I—*suite*

	1924												
	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	TOTAL
Méningite cérébro spinale	10	7	14	2	3	2	1	1	2	23	10	1	76
Gastro entérite toxique			5		3		1	2	1	5	1	2	20
Congestion cérébrale	4	3		3	1	1	1		5	1	1		20
Fièvre avec convulsions											1		1
Vomissements et convulsions													
Tetanos	1					2					1	1	5
Malaria cérébrale				1									1
Fièvre pernicieuse et convulsions	1						1		3	1			6
Convulsions		1				1		1	2		2		7
Entérite chronique		1			1			2	3	1			8
Gastrite aigue									1				1
Intoxication	1	5					1	2		2	1		12
Fièvre haute (cérébrale)													
SOMME	17	17	19	6	8	6	5	8	17	33	17	4	157

TABLEAU I—*suite.*

	1923												
	Janvier.	Février.	Mars.	Avril.	Mai.	Juin.	Juillet.	Août.	Septembre.	Octobre.	Novembre.	Décembre.	TOTAL.
Méningite cérébro-spinale ..	3	16	8	3	3	..	1	1	2	3	3	1	44
Gastro-entérite toxique ..	1	1	..	..	1	..	..	..	..	2	1	1	7
Congestion cérébrale ..	1	1	..	2	..	1	2	..	2	2	1	1	13
Fievre avec convulsions ..	1	..	..	..	..	..	..	..	..	..	..	..	1
Vomissements et convulsions ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tetanos	..	..	..	1	..	..	1	..	..	..	..	..	2
Malaria cérébrale	..	..	..	..	..	1	..	..	..	..	..	..	1
Fievre pernicieuse et convulsions	..	..	..	..	1	..	..	1	2	..	..	..	4
Convulsions	1	2	2	..	1	..	1	..	1	..	3	..	11
Entérite chronique ..	..	2	1	..	..	..	1	1	..	..	..	..	5
Gastrite aigue	..	..	..	..	1	..	..	..	..	..	..	..	1
Intoxication	1	..	..	..	..	..	..	..	..	..	..	..	1
Fievre haute (cérébrale) ..	1	..	..	..	1	..	..	..	..	..	..	..	2
SOMME ..	9	22	11	6	8	2	6	3	7	7	8	3	92

TABLEAU I—*suite*

	1926												
	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	TOTAL
Méningite cérébro spinale	2	1		1	4	4	2	23	26	18	15	29	125
Gastro entérite toxique	2			2	1	1	4	10	1	1	1		23
Congestion cérébrale							2	1			1		4
Fievre avec convulsions									1				1
Vomissements et convulsions					1			3	3		1		8
Tetanos			1		1			1	1				4
Malaria cérébrale	2	1						1					4
Fievre pernicieuse et convulsions	1		1		1				1	1			5
Convulsions	2	3	1		4	1	3	2	1	2	1		20
Enterite chronique					1								1
Gastrite aigue	1												1
Intoxication	2							1					3
Fievre haute (cérébrale)	1												1
SOMME	13	5	3	3	13	6	11	42	31	22	19	29	200

TABLEAU I—*suite.*

	1925												
	Janvier.	Février.	Mars.	Avril.	Mai.	Juin.	Juillet.	Août.	Septembre.	Octobre.	Novembre.	Décembre.	TOTAL.
Méningite cérébro-spinale ..	3	12	4	3	..	..	2	5	2	1	1	1	34
Gastro-entérite toxique ..	..	..	1	..	..	..	..	2	1	1	2	1	8
Congestion cérébrale ..	1	1	..	..	3	..	1	..	..	..	..	..	6
Fievre avec convulsions ..	..	..	..	..	..	1	..	..	..	..	..	..	1
Vomissements et convulsions ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tetanos	..	..	3	1	..	..	..	..	1	..	1	1	7
Malaria cérébrale	..	..	1	..	..	..	..	..	..	..	..	..	1
Fievre pernicieuse et convulsions	..	1	..	2	..	3	2	..	..	..	..	2	10
Convulsions	2	3	2	1	1	..	1	2	..	2	3	1	18
Entérite chronique ..	..	..	1	..	..	..	..	..	1	..	..	..	2
Gastrite aigue	1	..	..	..	1	..	..	..	..	..	..	..	2
Intoxication ..	..	2	3	..	..	2	..	1	..	1	1	2	12
Fievre haute (cérébrale) ..	1	..	..	1	..	..	..	1	..	..	..	..	3
SOMME ..	8	19	15	8	5	6	6	11	5	5	8	8	104

TABLEAU II

Travail accompli par les equipes antimeningitiques

Circonscription sanitaire de Salcete	Cas	Decès	Desinfections du rhino pharynx	Desinfections domiciliaires	Personnes suspectes enregistrees
EQUIPE SANITAIRE					
1 délégué speciel 2 médicins 8 infirmiers					
VILLAGES					
Raia	2	2	898	4	8
Chinchinim	3		544		
Margão	3		1 041		24
Varca	3	2	2 191	3	46
Seraulim	1		19		
Dramapur	4		960		9
Navelim	7	1	1 773	1	58
Sirlim	2		508		3
Chandor	3	1	231	1	22
Telaulim	1		42		6
Aquem	1		177		5
Benaulim	4		861		19
Verna	4		2 560		26
Colva	2		441		4
Majorda	1		1 048		5
Loutolim	3	1	68	1	16
Sernabatim			247		
Orlim			642		
Nuvem			14		
Guirdolim			72		
Curtorim			150		5
Raçaim			478		
SOMME	44	7	14 965	10	256

Le Poste Prophylactique de Agacaim (Ilhas)

EQUIPE SANITAIRE 2 infirmiers

Depuis 13 Mars jusqu'à 10 Mai la désinfection prophylactique fut appliquée à 15 222 passagers provenant des circonscriptions infectées

TABLEAU I—*fin*.

	1927			
	Janvier.	Février.	Jusqu'à 10 Mars, 1927.	TOTAL.
Méningite cérébro-spinale ..	31	24	5	60
Gastro-entérite toxique ..	..	..	..	..
Congestion cérébrale ..	1	1	..	2
Fiévre avec convulsions ..	1	..	..	1
Vomissements et convulsions ..	2	1	..	3
Tetanos	..	..	..	..
Malaria cérébrale	1	..	..	1
Fiévre pernicieuse et convulsions	..	..	..	..
Convulsions	1	1	..	2
Enterite chronique ..	..	1	..	1
Gastrite aigue	..	..	..	..
Intoxication	..	1	..	1
Fiévre haute (cérébrale) ..	..	..	..	..
SOMME ..	37	29	5	71

TABLEAU III.

Relevé des cas et décès de la meningite cérébro spinale enregistrés pendant la période de 11 Mai jusqu'à 6 Juin, 1927, date dans laquelle le Conseil de Santé et d'Hygiène déclara avoir fini l'episode épidemique de ce maladie, ainsi que des mésures adoptées par les equipes sanitaires

	11 jusqu'à 17 Mai.					18 jusqu'à 24 Mai.					25 jusqu'à 31 Mai					1 jusqu'à 7 Juin.				
	Cas.	Decès	Desinfections du rhino pharynx.	Desinfections domiciliaires.	Personnes suspectes enregistrées	Cas	Décès	Desinfections du rhino pharynx.	Desinfections domiciliaires	Personnes suspectes enregistrées	Cas	Decès	Désinfections du rhino pharynx.	Desinfections domiciliaires	Personnes suspectes enregistrées.	Cas	Decès	Desinfections du rhino pharynx.	Desinfections domiciliaires	Personnes suspectes enregistrées.
Circonscription sanitaire de Salcete.																				
Navelim	..	..	..	..	..	.	.				1	1	326	2	16	3	..	159	.	33
Colvá	..	..	..	..	..	3	1	138	1	12			..	.	.	..	.			.
Circonscription sanitaire de Velim.																				
Cavelossim	1	..	228	2	8	..	1			.							.	.		..
Cuncolim	1	..	..	..	..	..	..			.			.			.	..			..
Circonscription sanitaire de Mormugão.																				
Cortalim	5	..	1 251	3	33	1	..	791	..	4	1		1 084	5				49	.	.
S. Thomé	2	..	280	1	..	..	..	322	1	..	.		241	.				17	.	.
Velsão ..	..	..	270	1	..	..	..	103	2	..	.		93					40		
Somme	9	..	2 035	7	41	4	2	1 354	4	10	2	1	1 744	1	16	3		265		33

TABLEAU II—*fin.*

Circonscription sanitaire de Velim.	Cas.	Décès.	Désinfections du rhino-pharynx.	Désinfections domiciliaires.	Personnes suspectes enregistrées.
EQUIPE SANITAIRE : 1 délégué spéciel ; 2 médicins ; 8 infirmiers.	..	..	..	..	..
VILLAGES.					
Cuncolim	4	..	2.669	1	4
Velim	2	..	5.444	..	8
Chinchinim ..	9	2	9.314	13	155
Sarzorá	6	..	951	3	7
Assolná	3	..	2.070	2	7
Deussua	1	..	1.308	..	120
Cavelossim ..	..	1	165	..	8
Carmoná	..	..	36	..	..
SOMME ..	25	3	21.957	19	309

Circonscription sanitaire de Mormugao.	Cas.	Décès.	Désinfections du rhino-pharynx.	Désinfections domiciliaires.	Personnes suspectes enregistrées.
EQUIPE SANITAIRE : 1 délégué spéciel ; 2 médicins ; 7 infirmiers.					
VILLAGES.					
S. Thomé	19	1	5.907	35	273
Velção	10	..	2.452	27	225
Vasco da Gama ..	4	4	2.936	..	20
Chicalim	6	..	3.105	..	37
Cortalim	55	2	12.295	23	434
SOMME ..	94	7	26.695	85	989

Le Poste Prophylactique de Agacaim (Ilhas).

EQUIPE SANITAIRE : 2 infirmiers.

Depuis 13 Mars jusqu'à 10 Mai la désinfection prophylactique fut appliquée à 15.222 passagers provenant des circonscriptions infectées.

tiques depuis 8 Juin jusqu à 19 Juillet avant la recrudescence saisonniere

28 Juin		29 Juin jusqu a 5 Juillet					6 jusqu a 12 Juillet					13 jusqu a 19 Juillet				
Desinfections domiciliaires	Personnes suspectes enregistrees	Cas	Decès	Desinfections du rhino pharynx	Desinfections domiciliaires	Personnes suspectes enregistrees	Cas	Deces	Desinfections du rhino pharynx	Désinfections domiciliaires	Personnes suspectes enregistées	Cas	Décès	Desinfections du rhino pharynx	Desinfections domiciliaires	Personnes suspectes enregistrées
8			1	4	29	1	1		2	29				157		
17	1															
												1	1	125	1	
25	1		1	4	29	1	1		2	29		1	1	2[illegible]	1	

THE TIME-FACTOR IN DISINFECTION, DISINSECTIZATION AND STERILIZATION: A PRACTICAL METHOD OF CONTROL.

BY

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ALL methods of bulk disinfection in which heat is the lethal agent depend on (*a*) the effective degree of heat employed; (*b*) the time during which it is operative; (*c*) the penetration of the heat to every part. The maximum degree of heat employed is easy to regulate, but the time during which it is effectively operative, the minimum degree of interior heat and the degree of penetration attained present problems of some difficulty, to which no disinfecting plant provides an adequate answer.

It is self-evident that, for heat-disinfection to be economical as well as effective:—

(*i*) The minimum degree of interior heat must be little in excess of what is known to be just sufficient for the purpose in view.

(*ii*) It must be applied for a period of time little in excess of what is known to be effective.

(*iii*) It must penetrate to *every portion* of the material to be disinfected.

No existing plant will ensure that these axiomatic requirements are met, for the reason that the penetration of the heat into the interior of the material, is left almost entirely to chance, or at most only proved or disproved after the process is over; and the time-factor, on which the success or failure of the process so largely depends, is commonly ignored.

Recording instruments, gauges and thermometers are concerned only with the temperature inside the shell of the disinfector and on the outer surface of the material and give no information regarding heat penetration into the mass of the material.

The resistance to the passage of heat in any given case depends not only on the character of the heat employed, e.g., dry heat, current steam, or super heated steam but also on factors which are incalculable, i.e., with the nature of th material, its physical state and its method of packing, but no disinfecting proce can be said to be complete, scientific, reliable or economical unless it tak into account the time-factor, both as regards the time required to attain a give

date dans laquelle le Conseil de Sante et d'Hygiene Publique resolut entreprendre une de la vaccine prophylactique

3 jusqu a 9 Aout					10 jusqu a 16 Aout					17 jusqu a 23 Aout				
Cas	Deces	Désinfections du rhino pharynx	Désinfections domiciliaires	Personnes suspectes enregistrees	Cas	Decès	Désinfections du rhino pharynx	Desinfections domiciliaires	Personnes suspectes enregistrées	Cas	Decès	Desinfections du rhino pharynx	Désinfections domiciliaires	Personnes suspectes enregistrees
6	2	701	3	18	3	1	1 026	3	18	2		152		7
6	2	343	2	26	4	1	472	1	[illegible]	3		773		13
		289												
1		107		8										
1		113	2	19			90			[illegible]		[illegible]		13
1	1		1											
							31							
					4	2	[illegible]	2	13	[illegible]		347		15
										[illegible]		330		10
										2		18		11
										2	1	166	1	10
15	5	1 6[illegible]	8	71	11	4	1 871	6	[illegible]	15	1	21[illegible]	1	85

of all the infectious diseases of the digestive organs, typhoid fever prevails with the greatest force in this country Moreover, the typhoid bacillus is not only the most important of those of infectious diseases, but possesses comparatively strong power of resistance and can be easily detected Further, there are reasons to believe that, once the duration of existence of the typhoid bacillus is definitely known those of the bacteria of paratyphoid, dysentery and other diseases of the digestive organs can be easily and successfully ascertained In the matter of eggs of parasites to be used for these studies, we made use of those of round worms and hookworms for they are usually found in the excrements of the people of the farmer classes

In the experiment with the typhoid bacillus we mixed with night soil a large quantity of new culture of the bacteria as fresh as possible and ascertained by means of culture examination how long it would take before they were exterminated in the excreta deposit In performing the cultures, we used a plentiful amount of Endo media We endeavoured to avoid errors in the experiment by identifying the germs with the agglutination reaction and by carrying out the experiments repeatedly

In the experiments on the eggs of round worms and hookworms we selected the excrement of a certain farmer's family, in which we found many eggs of these worms in the examination previously carried out, taking a portion of the excreta out of the privy in the farmer's house every day and used it for the purpose of our studies The following culture method was employed in ascertaining the longevity of the eggs First the eggs washed out of night soil were placed on a broken piece of Japanese tile and then the piece of the tile with the eggs on it was put in a glass dish, into the bottom of which some water was poured, and the dish was covered by a glass plate so as to supply the eggs on the tile with humidity always In summer this dish was not incubated, but in winter it was put in an oven heated to about 28°C Next, in the case of the eggs of round worms, we inspected whether or not larvæ had grown in the eggs, and, in the case of eggs of hookworms, whether or not larvæ had swum out into the water in the dish and, by these means, we confirmed whether the eggs maintained their life or not Special care was exercised to distinguish the larvæ of hookworms from those of other worms

By the above mentioned methods, we ascertained the term of the life of the bacteria of typhoid fever and of the eggs of round worms and hookworms in the solution of night soil kept in the experimental receptacle

THE LONGEVITY OF THE TYPHOID BACILLUS IN NIGHT SOIL

The receptacle of night soil used for the afore mentioned experiment was a jar commonly used in the privy of ordinary Japanese houses and has a depth of 1 5 feet, a diameter of 1 8 feet and a capacity of 60 to 100 litre This was filled with night soil taken from the privy of an ordinary house Then, the culture of the typhoid bacillus was mixed at the ratio of 1 5 mg per 100 c c. of night soil and,

BACTERIOLOGICAL AND PARASITOLOGICAL STUDY OF THE NIGHT-SOIL DISPOSAL IN JAPAN.

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In Japan, night-soil is largely used as manure by farmers, so that it is clear that it is instrumental in increasing the danger of the spread of the infectious diseases of the digestive organs and diseases by parasites, as may be seen from the fact that, at the present time, no small number of cases of such infectious diseases of the digestive organs as typhoid fever, dysentery, etc., are reported in this country. Further, diseases from the round-worm, hookworm and other kinds of parasites are prevalent among the people. That, although efforts have been made in various ways for the prevention and extermination of these diseases, satisfactory and effective results have not yet been obtained, is to be attributed to the fact that appropriate and full measures have not been taken in regard to the disposal of night-soil which constitutes the basic provision for the realization of the object. For the past several years, the health authorities have been occupied with the study of this problem, and, as I have conducted researches and experiments concerning the disposal of night-soil with my colleagues, Drs. Naito, Minamizaki, Katsumata, Hamano and other medical officers of the Central Sanitary Bureau, I should like to report on the results of the studies so far made by us.

Scope of Studies and Methods Employed.

Taking into account the power of resistance of pathogenic bacteria in night-soil we considered that the use of disinfectants and heating processes were not fit for the actual disposal of night-soil and, believing that it is the most practical means to utilize the process of the extermination of the pathogenic bacteria through the natural putrefaction of night-soil, we continued our studies and experiments in that direction.

In order to utilize the said process of the extermination of the bacteria by the natural putrefaction of night-soil, it was essential to ascertain the term of existence of pathogenic bacteria in a night-soil deposit. In this experiment, we applied the typhoid bacillus as the pathogens of the digestive organs, for

TABLE I—*concld.*

Pit No	Strain	Beginning of Examination	End of Examination	Terms of Longevity	Temperature in Receptacle	
					Highest	Lowest
20	Sh	16 xii	7 v	142	15 0	0
21	"	"	6 "	141	"	"
22	Mo	"	26 "	159	16 0	"
23	"	"	6 "	141	15 0	"
24	St	"	8 vi	174	18 0	"
25	"	"	3 "	169	15 0	"
26	Sh	3 ii 1926	6 v	101	15 0	2
27	Ku	9 iii	7 vi	89	18 0	3 5
28	Ya	11 vi	16 vii	35	24 0	15 0
29	Sh	"	13 "	32	22 5	15 0
30	Ha	"	12 "	31	22 0	15 0
31	On	22 vii	1 viii	10	25 0	23 0
32	Sh	"	31 vii	9	"	"
33	"	31 vii	11 viii	11	27 0	23 0
34	Ya	3 viii	14 "	11	27 0	23 0
35	Sh	5 x	30 x	26	19 0	12 0
36	Mi	"	24 ii 1927	142	19 0	—1 0
37	Ik	12 "	24 iii	163	18 0	—1 0
38	Ty	12 "	7 "	146	18 0	—1 0

Sh .. . . Laboratory Strain.
Sa, Ts, St, On, Ik . .. .. From patient's fæces.
Ki, Ku Ha .. .. . From patient's blood
Iw, Su Mo, Ya, Ty .. .. .. From carrier's fæces.

As we carried out this experiment thirty-eight times through all the seasons of the year, we think we have succeeded in fixing the term of existence of the typhoid bacillus in a night-soil deposit, as is shown in the foregoing table It may be seen, therefore, that in the height of summer the typhoid bacilli are completely destroyed in about ten days, but the term of their longevity becomes longer in

in order to ascertain the equal distribution of the bacteria, materials for inspection were taken from the upper, middle and lower layers of the contents of the jar and they subjected to cultural experiment. For a number of days we had continued the cultural experiment till finally we were unable to detect any typhoid bacilli. In making the final decision, we conducted the experiment with particular care and attention and, only when no bacillus was detected in the successive three experiments, we concluded that the bacteria had become extinct. The results of these experiments are tabulated as follows :—

TABLE I.

Terms of Longevity of Typhoid Bacillus in the Experimental Privies.

Pit No.	Strain.	Beginning of Examination.	End of Examination.	Terms of Longevity.	Temperature in Receptacle.	
					Highest.	Lowest.
1	Sh	15. vi. 1925	2. vi.	47	19·5	13·5
2	Sa	20. v.	28. vi.	39	23·0	15·5
3	Ki	„	„	„	„	„
4	Sh	21. v.	4. vii.	44	23·0	15·0
5	Sa	3. viii.	10. „	7	26·0	24·0
6	Sh	„	9. viii.	6	„	„
7	Ki	„	10. „	7	„	„
8	Sh	5. ix.	12. ix.	7	26·0	23·0
9	„	„	9. „	4	„	„
10	„	24. ix.	2. x.	8	23·0	21·0
11	Ts	„	1. „	7	„	„
12	Iw	„	2. „	8	„	„
13	Sh	19. x.	12. xii.	55	17·0	6·0
14	„	28. x.	31. „	64	16·0	3·5
15	„	„	15. „	48	16·0	6·0
16	Su	6. xi.	19. „	43	14·0	3·5
17	„	„	17. iii. 1926	131	14·0	0
18	Mi	„	5. v.	180	„	„
19	„	„	8. „	183	15·0	„

The following table shows the results of experiments repeatedly carried on since 1925 —

TABLE II

The Terms of Longevity of Hookworm Eggs and Round worm Eggs in the Experimental Privies

Pit No	Date of Installing Pit Beginning Exam			Period required for collection of material (Days)	Terms of Longevity of Hookworm Eggs (Days)	Terms of Longevity of Round worm Eggs (Days)
1	1925	vi	28	10	86	111
2	„	v	4	7	66	—
3	„	vi	5	(1) 30	55	86
4	„	vi	10	9	69	—
5	„	vi	23	8	66	76
6	„	vii	6	10	45	238
7	„	ix	9	8	59	— (3) 1926 viii 30 Dead Alive
8	„	x	5	8	148	333 { Upper layer 138 3 Lower layer 118 1
9	1925	x	15	14	138	—
10		—		—	Incubator gets out of order	—
11		—		—	„	— (3) 1926 viii 28 D A 256 Lower layer 418 1
12	„	xii	16	16	„	
13	1926	i	13	13	„	279
14		—		—	„	—
15	„	i	29	14	„	280
16	„	ii	18	11	117	311 (3) 1926 vii [illegible] D. A.
17	„	iii	11	10	111	120 Upp[illegible] [illegible] 2 (3) 1926 [illegible] D. [illegible]
18	„	iii	16	15	68	204 { Upper l. 314·25 Lower l. 341 2 (3) [illegible] D A.
19	„	iv	30	10	89	[illegible] { [illegible] 73·13 [illegible] [illegible] 2 (3) [illegible] D. A.
20	„	v.	18	8	[illegible]	[illegible] 66: 1

proportion to the lowering of temperature, they are alive for nearly one month in June and October and for two months in early summer and late autumn ; and, in the dead of winter, a small number of them survive the cold and continue to live till spring. (These experiments were conducted in Tokyo.)

As the term of their longevity differs to a more or less extent according to the strains of the bacteria and also to the nature of night-soil, it would be safe to take as the standard of its duration the largest number of days obtained by the above-mentioned experiments. Therefore, it may be seen that, in order to make night-soil safe from the danger of becoming the transmitting medium of various diseases by simply keeping it in a receptacle, it will take from one to three months, and that the night-soil kept in winter becomes sterilized in April and May of the following year.

The typhoid bacillus in night-soil gradually decreases in number in the course of time, so that there is no more effective means of making the night-soil safe from the standpoint of public hygiene than keeping it simply in a receptacle for a period of time. Particularly, in summer, the termination of the bacteria takes the shortest period of time and they are completely destroyed within ten days. Therefore, the disposal of night-soil will be easily effected only by means of its natural putrefaction in summer. As it is usual that the largest number of cases of typhoid fever is reported in summer in Japan, the cause of the prevalence of the disease in the season may be easily controlled if proper attention be paid to the keeping of night-soil for sufficient period, and, thus considered, the disease may be expected to decline gradually in this country.

The Longevity of the Eggs of Round-worms and Hookworms in Night-soil.

The receptacle used in this experiment was the same as in the case of the typhoid bacillus. In it was put the excrement (mixed with urine) which contains a large number of the eggs of parasites, and, from time to time, materials were taken from the upper, middle and lower layers of its contents and examined. Great care was exercised in finding out whether or not the eggs were alive. After the incubation of the material for three weeks to one month in the manner as stated above for the purpose of egg cultivation, a portion of a bean size was taken from the culture material on the tile piece and it was dealt with antiformin and ether to examine the condition of the growth of the eggs. In the case of the eggs of hookworms, water in the dishes was collected after five to ten days of culture and, by means of centrifugal sedimentation the existence or otherwise of larvæ was ascertained.

The eggs of these worms do not grow in night-soil at all and, as only those which remain alive grow under the process of culture, the existence or otherwise of them can be certainly demonstrated by the afore-mentioned cultural experimentations.

some eggs the experiment on which was started toward the end of autumn continued to be alive throughout the winter and some perished after they had maintained their life for more than one year It must be borne in mind however that the night soil kept in an experimental privy for more than one year presents considerable changes in its nature Anyway if night soil containing the eggs of round worms is made safe by keeping it simply in a receptacle it must be kept for several months even in summer and that excreted in autumn or winter cannot be made absolutely safe unless it is kept for nearly one year

The eggs of hookworms too do not grow in night soil and begin to perish by degrees The term of their longevity is the shortest in summer and some entirely perish in about one month In spring and autumn it extends for three months and in winter some of the eggs continue to be alive till spring The eggs of these worms will perish if they meet with severe cold but as it is beyond imagination that the cold will penetrate into the bottom of the night soil jar it would be correct to think that the eggs in the night soil kept in winter will continue to be alive for many months It may be understood therefore that in order to bring about the extinction of the eggs of hookworms in night soil by the simple method of keeping it in a receptacle it is essential to keep it for several months

The Liquefaction of Night soil and Sinking of the Eggs of Parasites

While night soil is being kept it gradually liquefies The middle part changes into a turbid fluid and the lower part into soft muddy substance and the upper part is covered by a scum At first the liquefied part contains the eggs of parasites but when left undisturbed for a long time they all sink to the bottom of the jar The specific gravity of the parasite eggs is greater than that of the fecal fluid

The eggs sunk into the lower stratum of the night soil fluid do not grow and tend to perish by degrees Therefore if night soil is kept in a tall cylinder undisturbed and left to liquefy for some time and then the upper stratum of the liquefied part is taken out and examined it will be found that there is no egg in it

It is clear therefore that if this phenomenon is utilized to advantage in the improvement of the privy it is by no means difficult to keep and destroy the eggs of parasites which have comparatively strong powers of resistance

A Newly Devised Privy

In accordance with the basic experiments described above we have devised new night soil receptacles and the various experimentations have led us to believe that a model constructed as stated below is most suitable for the purpose of making night soil safe

TABLE II—*concld.*

Pit No.	Date of Installing Pit Beginning Exam.	Period required for collection of material (Days).	Terms of Longevity of Hookworm Eggs (Days).	Terms of Longevity of Round-worm Eggs (Days).
21	1926. vii. 10	10	40	195 Still under experiment. 1927. viii. 31 D. A.
22	,, viii. 30	12	29	374 Upp. l. 226 : 3 ,, 1927. viii. 22 D. A.
23	,, x. 2	16	77	325 { Upp. l. 353 : 9; Midd. l. 343 : 7; Low. l. 288 : 5 } ,, 1927. viii. 22 D. A.
24	,, xii. 7	15	(2) (31)	259 { Upp. l. 75 : 1; Midd. l. 88 : 0; Low. l. 167 : 0 } ,, 1927. viii. 22 D. A.
25	1927. i. 25	14	(2) (7)	210 { Upp. l. 210 : 20; Midd. l. 117 : 5; Low. l. 128 : 7 } ,, 1927. viii. 15 D. A.
26	,, iii. 31	11	90	152 { Upp. l. 453 : 85; Midd. l. 726 : 6; Low. l. 589 : 2 }

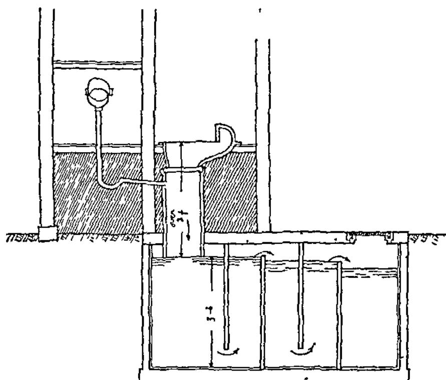
(1) Contains fæces only, and no urine. The pit was filled up in 30 days time.
(2) Probably due to the extremely cold weather.
(3) Had to stop experiment on account of storm water getting into the pit, after the days indicated.

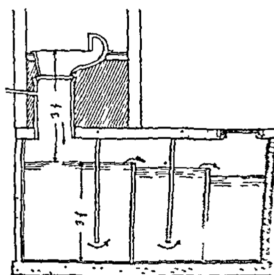
Legend :	Atmospheric Temperature.		Temperature in the Pit.	
	Max.	Min.	Max.	Min.
1925 ..	32°·0C.	Below Zero 10°·5C.	29°·5C.	2°·5C.
1926 ..	38°·5C.	,, ,, 10°·5C.	29°·5C.	1°·5C.
1927 ..	37°·5C.	,, ,, 11°·5C.	29°·5C.	Below Zero 2°·0C.

As is shown by the foregoing table, the eggs of round-worms do not grow in night-soil; on the contrary, they gradually tend to extinction. In summer they perish most speedily, although it takes three months at the shortest. In spring and autumn, the term of their life becomes longer and there were instances in which

As the fifth compartment serves as a repository from which the fluid is taken out, its size is quite optional, but the four compartments from the first to the fourth

The Newly Devised Privy.





each requires a fixed capacity. If we take a family of [illegible] persons as the [illegible] in our calculations and if we assume that each person excretes 1 litre of [illegible] and urine daily on an average, the total quantity of the night-soil excre[illegible]

The receptacle is made of concrete, the inside being coated with water-proof mortar, and except the tube for leading in night-soil and the man-hole for taking it out are closed. The tube is either so made as to come into contact with the surface of night-soil (scum level) or entirely separated from it. If the tube touches the scum level it will more or less facilitate the prevention of the spread of odour, but, as it is feared that fresh night-soil and pieces of toilet-paper let down will be piled up near the end of the tube and may gradually come up the tube to a certain height, it is thought advisable to use a tube with an inner diameter of 1 foot and also to make it as long as possible, the proper length being more than 3 feet. Even in the case of separating the end of the tube from the scum level as it is usual that the surface of the liquid in the first compartment is somewhat higher than that in the second, device must be made to lower it as far as possible. This can be done by making the space between the second partition and the upper wall comparatively large.

The night-soil receptacle newly devised by us is an oblong box which is divided into five compartments by four partitions. The first compartment is the largest and receives fresh night-soil and liquefies it. The liquefied night-soil enters the second compartment from under the first partition and, when the second compartment is filled to the full capacity, it flows down into the third compartment over the upper end of the second partition. From the third compartment it enters the fourth compartment from under the third partition and, when the latter is full, it flows into the fifth and last compartment over the fourth partition. The four compartments from the first to the fourth serve for keeping night-soil and are always filled with it. They have a combined capacity for keeping the night-soil excreted by a family for about 100 days. It follows, therefore, that the night-soil that falls into the first compartment will appear in the fifth compartment after about 100 days, and it is also clear that, as night-soil falls into the first compartment the liquid proportionate to its quantity will enter the fifth compartment from the fourth compartment.

As the liquefied night-soil moves slowly from the first compartment to the fourth, the eggs of parasites all sink to the bottoms of those compartments and the bacteria will also sink and be kept there to a more or less degree. Further, it is not difficult to suppose that the muddy substance that grows and accumulates at the bottom of the first compartment, will more or less serve as a filter for the bacilli and parasite eggs.

The fluid in the receptacle, however, may be stirred by an alternating current caused by heat or by the generation of gases. It is also likely that, in the first compartment, solid substances may be piled up before they are liquefied and thereby form special course or courses for the flowing of the fluid. Now, such bacteria as typhoid bacillus move about to a more or less extent even in liquefied night-soil, so that their movement in the receptacle cannot be definitely known unless it is examined in its actual condition.

Table III

Fate of Typhoid Bacilli in the Newly Devised Privy

Week of Experiment	Date	Chamber in the Privy I	II	III	IV	V
	15 iv 1927	++++	0	0	0	0
1	25 iv – 30 „	++++	+++	±	±	0
2	2 v – 7 v	++++	+++	±	+	0
3	9 „ – 14 „	++++	+++	++	±	0
4	16 „ – 21 „	++++	+++	+++	+	±
5	23 „ – 28	++++	+++	+++	++	±
6	30 „ – 4 vi	++++	+++	++	+	±
7	6 vi – 11 „	++++	+++	++	+	±
8	13 „ – 18 „	++++	+++	++	+	±
9	20 „ – 25	++++	+++	++	+	±
10	27 „ – 2 vii	++++	++	++	+	0
11	4 viii – 9 „	++++	++	++	+	0
12	11 – 16 „	++++	++	++	+	0
13	18 „ – 23 „	++++	++	+	±	0
14	25 „ – 30 „	++++	+	+	0	0
15	1 viii – 6 viii	++++	+	0	0	0
16	8 „ – 13 „	++++	+	0	0	0
17	15 – 20 „	++++	+	0	0	0
18	22 „ – 27 „	++++	+	0	0	0
19	29 „ – 3 ix	++++	+	0	0	0
20	5 ix – 10	++++	+	+	0	0
21	12 „ – 17	++++	+	0	0	0
22	19 „ – 23 „	++++	+	0	0	0
23	26 „ – 1 x	++++	+	+	0	0
24	31 x – 8 „	++++	++	+	0	0
25	10 „ – 15 „	++++	++	++	±	0
26	7 „ – 22 „ (still under experiment)	++++	++	++	+	0

A certain quantity of material is taken daily from each chamber. This material being cultured, colonies of typhoid bacilli are counted and their average number is taken as weekly result. The fecal matter that contain 1.5 mg typhoid bacilli per 100 c.c. is put into chamber I every day, and the result of its culture is almost constant which is indicated by ++++. Where the number of typhoid bacillus colony is reduced to 1/10-1/100 is shown by +++ and 1/100-1/1000 by ++ and 1/1000-1/1000 000 by +. If further reduced, it is denoted by ± and if no typhoid bacillus was found at all by 0.

The above result reveals the fact that in case where extermination was not completed in the new privy, due to the low temperature, the typhoid bacilli thrown into the privy was recovered still alive in the last chamber after the lapse of a month. However, the number of such surviving bacilli was very few even in the winter experiment, their proportion to the number of bacilli in the first chamber being several ten thousandth. The last chamber is rendered quite safe from the last part of June to October and probably to some time after October.

The preceding experiments were done in a privy in which the depth of fecal matters was three feet. In the privy with the depth of four and a half feet, not a

On March 13 1926, the material began to overflow to chamber III (last chamber) In the middle part of July, we began examination and are still keeping at it

Method of Examination

Some 1,000 to 1 500 c c of liquefied fæcal matters are taken from the upper layer of chamber II, diluted with water, its deposit collected and washed with water, and are examined by means of the tile culture method

The result

As to the round worm, no live egg was found except for a very few which were found together with dead ones in September 1926 and in May 1927

As to the hookworm egg, so far none was proved in spite of the careful examinations

It may be said, therefore, the content of the chamber III is always safe However, if we examine the material taken from the bottom part of the chamber II, we find innumerable live eggs, as well as dead eggs, in its 100 c c This shows that parasite eggs sink down and are held at the bottom of the chamber II and perish there in the due course of time.

Experiment No II

The privy with three chambers and two partitions

Depth, two feet seven inches

Capacity of chamber I, about 30 cubic feet A certain 'K' family was made to use this privy The family consisted of 6 adults and 2 children Their excreta contained plenty of eggs of round worm and hookworm The use of privy began September 5 1926 The material began to overflow to the last chamber (chamber III) on August 22, 1927 Since then, the material from the last chamber has been examined and so far no parasite egg was found out

Experiment No III

The privy consisting of five chambers with four partitions in it.

Depth, 2 7 feet

Capacity of the first chamber 16 cubic feet A family 'N' was [illegible] to use it.

The family consisted of 4 adults and 4 children The[illegible] contained plenty of round-worm eggs and hookworm eggs

The use of privy began October 15, 1926 Ov[illegible] chamber began August 31, 1927, and on that day the [illegible]

So far, no egg at all has been found

The Results obtained by the Practical [illegible] Privy.

We installed some of our improved [illegible] their contents In this experiment, [illegible] any kind including those of round [illegible] We also conducted the same ex[illegible]

typhoid bacillus was found in the last chamber after the lapse of same period of time.

Thus it is seen that high temperature and depth of the privy strengthen the disinfection, and therefore in the cold places the privy could be made more effective if it is buried as deep in the ground as possible, thus kept in high temperature and the depth of the privy deepened.

During the interval between July and September, the third chamber is also found safe. Therefore, in the locality where high temperature prevails, a privy consisting of three chambers with two partitions will effectively destroy the germs.

This is of much interest from the practical point of view if compared with the fact that the three-chambered privy is effective enough against parasite eggs.

In Japan, typhoid fever prevails predominantly in summer and autumn, so that it is most important from the standpoint of disease prevention that the disposal of night-soil is executed in perfectly sanitary manner in these seasons. In view of the fact that our improved privy exhibits particularly strong sterilizing effects in the summer season when a high temperature prevails, we have no doubt that its general application will bring momentous results in preventing typhoid fever.

In winter the night-soil is usually not used as manure. Therefore the danger from the existence of a very small number of the bacteria in the fluid taken out from the fifth compartment would be quite insignificant.

The results obtained in the experiment with the eggs of parasites in the devised privy are even more remarkable. While conducting experiments by adding to the contents of the receptacle a suitable quantity of night-soil abundantly mixed with the eggs of round-worms and hookworms every day for two years, we could scarcely find the eggs in the upper part of the fluid in the second compartment. Therefore, if the receptacle is intended only for the prevention of diseases from parasites, it would serve the purpose most admirably by dividing it with only two partitions. The following protocol shows the main points of the results of experiments with a receptacle with two partitions :—

Experiments on the Extermination of Parasite Eggs with the Newly Devised Privy.

Experiment No. I.

The privy with three chambers and two partitions.

Depth, two feet.

Capacity of first chamber, 18 cubic feet. Experiment commenced on October 5, 1925. Five litres of fæcal matters have been put in every day since its commencement until this date. The fæcal matters thrown in contained many eggs, both of round-worm and hookworm.

A portion of the fæcal matter was cultured and it was ascertained that the eggs were alive.

OBSERVATIONS ON THE ACTIVATED SLUDGE PROCESS IN CALCUTTA

BY

LIEUT COL A D STEWART, M B, F R C S E, D P H, D T M & H, I M S,

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THE principles of sewage and night soil disposal and treatment are easily stated We aim at converting a dangerous septic, unstable, putrescent, and offensive material into something which will be safe, aseptic, stable, non putrescible, and inoffensive, by methods and means which should be economical, and free from nuisance and danger to the public In India, safety and freedom from nuisance and danger have usually to be subordinated to questions of expense Large towns are comparatively few, and as it is only in these that enough money is available for modern sewerage systems, the mass of the country must for a long time put up with conparatively primitive methods of night soil disposal That biological processes can be successfully worked in India has been demonstrated by the number of septic tank latrine installations in Bengal and elsewhere These are somewhat expensive however, and of the aerobic filters used for nitrification it cannot be said that they are free from nuisance, in fact they very seldom are under ordinary conditions of work The activated sludge process, the newest of the biological processes, has elsewhere given results satisfying most of the conditions stated above, and it is desirable that this process should be examined as much as possible under the varying conditions of Indian climates and circumstances The best description of the history and methods of the activated sludge process is probably given by Martin(1)

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Shortly stated, the process is one by which a sludge rich in purifying elements is first prepared This, mixed with raw sewage to the proportion of 10 to 15 per cent of sludge and aerated with agitation, should in the course of a few hours produce a fluid out of which the sludge settles quickly, leaving a supernatant fluid which satisfies the conditions in the opening sentences Features of the process are the great reduction of the *B coli* content and the fertility of the sludge In India, the process has been installed at Jamshedpur and has been reported on by Temple(2) We have in

prevalent, but we found that there was no egg of the parasite in the last compartment.

Similar experiments are going on with the clonorchiasis.

We have selected some of the carriers of the typhoid bacillus and are now making them use the improved privy and studying the results of this experiment. It is usually the case that even coli bacillus is not detected in the contents of the last compartment.

Already many people are using the privy of this type. In some villages, all the houses have replaced or are replacing the night-soil jars hitherto in use with our privies. Moreover, they are installed not only in ordinary dwellings but in such public buildings as schools, hospitals and hotels and are realizing excellent results. The local governments have adopted the policy of granting a fixed amount of subsidy to those who construct the privy equipped with our improved receptacles.

Programme of Future Experiments.

In order to accomplish the double object of encouraging the widespread use of this improved receptacle and of demonstrating its practical results on the betterment of public health, we have in contemplation the project of selecting several villages and of improving the privy in all the houses thereby equipping them with our newly devised receptacles, thereby obviating the chances of the villagers being affected by parasites and at the same time preventing the outbreak of the diseases of the digestive organs among them.

DISCUSSION.

Dr. S. L. Sarkar (Bengal) : Asked what were the advantages of the Japanese system over the trenching system prevalent in Bengal.

(No answer recorded.)

TABLE II

Lilloah Plant

Description	Name		Free ammonia	Albuminoid ammonia	4 hours oxygen: Raw	4 hours oxygen: Clarified	4 hours oxygen: Colloidal	Dissolved oxygen remaining: 24 hours	Dissolved oxygen remaining: 48 hours	Nitrite	Nitrate	Methylene blue discharged in
3 gallons per minute	(a)	Crude	4 8	44	3 6	2 4	1 2			Nil	Minute trace	
		Effluent	4 4	32	2 3	2 0	3			1 2	Present	
	(b)	Crude	1 6	12	3 3	1 4	1 9	38	Nil	Nil	Trace	4 days
		Effluent	2	08	2 5	1 1	1 4	58	55	4 0	Present	Not in 4 days
5 gallons per minute	(a)	Crude	6 4	32	4 6	3 1	1 5	21	15	Nil	Nil	2 days
		Effluent	6 0	28	3 6	1 5	2 1	29	19	1 2	Present	Not in 4 days
	(b)	Crude	2 0	08	5 0	3 8	1 2	31	24	Nil	Trace	4 days
		Effluent	1 8	04	3 6	2 0	1 6	53	37	1 2	Present	Not in 4 days
7 gallons per minute	(a)	Crude	3 5	04	4 7	4 0	–	22	11	Nil	Nil	10 minutes
		Effluent	2 5	08	3 9	1 5	2 4	27	22	22	Trace	4 days
	(b)	Crude	4 0	08	4 4	3 6	8	26	22	Nil	Nil	½ hour
		Effluent	3 0	04	2 8	2 4	4	43	38	2	Present	Not in 4 days
9 gallons per minute	(a)	Crude	1 8	05	2 7	1 3	1 4	29	Minute trace	Nil	Minute trace	1 day
		Effluent	2 6	05o	1 8	4 5	1 3o	33	27	V m trace	Minute trace	2 days
	(b)	Crude	3 04	12	3 0	1 9	1 1	36	V m trace	Nil	Nil	5 minutes
		Effluent	5 76	14	2 1	1 8	3	38	26	Nil	Nil	1 day

PARTS PER 100 000 (all columns except Methylene blue)

(a) = minimum purification
(b) = maximum purification
V m trace = very *minute trace*

TABLE I.

Shibpur Activated Sludge Plant Effluent.

Years.		Nature of effluents.	Suspended solid. Total.	Suspended solid. Organic.	Suspended solid. Mineral.	Free ammonia.	Albuminoid ammonia.	Nitrite.	Nitrate.	4 hours oxygen. Raw.	4 hours oxygen. Clarified.	4 hours oxygen. Colloid.	Alkalinity.	Chlorides.	Dissolved oxygen remaining. 24 hours.	Dissolved oxygen remaining. 48 hours.	Methylene blue discharged in
1925	(a)	Raw	134·8	..	..	9·0	1·6	*Nil*	*Nil*	13·5	5·1	8·3	..	21·0	*Nil*	*Nil*	1 hour
		Effluent	37·6	..	..	5·2	·7	Present	Trace	7·0	5·9	1·1	..	24·0	*Nil*	*Nil*	12 hours
	(b)	Raw	15·2	..	..	2·0	·8	·3	*Nil*	4·0	2·5	1·5	..	19·4	*Nil*	*Nil*	12 hours
		Effluent	1·4	..	..	·28	·1	1·1	·1	1·8	1·1	·7	..	18·0	·33	·19	Not in 4 days
1926	(a)	Raw	..	..	..	1·28	·16	*Nil*	*Nil*	2·5	..	..	Slight	12·0	·0	..	..
		Effluent	..	..	..	·96	·16	Minute trace	Trace	1·0	..	..	Do.	12·0	..	..	..
	(b)	Raw	22·2	18·0	4·0	·152	·012	*Nil*	*Nil*	9·0	..	..	Do.	16·0	..	..	..
		Effluent	·4	·4	*Nil*	·052	·005	*Nil*	Present	3·9	..	..	Do.	13·0	..	..	..
1927	(a)	Raw	95·2	44·0	51·2	6·0	·64	*Nil*	*Nil*	13·3	2·3	11·0	Do.	15·5	..	..	..
		Effluent	15·5	5·5	10·0	6·4	·6	*Nil*	Trace	3·4	1·3	2·1	Do.	14·5	..	..	..
	(b)	Raw	45·2	21·2	24·0	10·0	·84	*Nil*	Trace	8·6	3·3	5·3	Do.	14·0	..	..	..
		Effluent	10·0	2·0	8·0	6·0	·36	*Nil*	Trace	2·6	2·0	·6	Do.	11·0	..	..	..

(a) = minimum purification.
(b) = maximum purification.

Placing the results of the effluent underneath these, it is evident that up to a flow of seven gallons per minute (a contact period of about five hours) an effluent chemically suitable for discharge was obtained, stable clear and inoffensive The amount of sludge produced from this installation was however small in amount, never reaching ten per cent The reasons for this were probably the nature of the liquid treated and defective settling arrangements

When the rate was raised to nine gallons per minute deterioration in the chemical analysis was at once apparent, especially in the suspended solids and in the four hours oxygen figure

Speaking generally, therefore, a contact period of five hours with less than ten per cent of sludge will, with an installation of this sort give a satisfactory effluent The working is automatic, free of all nuisance and therefore represents a distinct advance on the aerobic filter

(3) The object of the above experiment was to test the capability of the plant in purifying septic tank effluent More detailed work was carried out on raw Calcutta sewage Temple at Jamshedpur has described successful treatment of raw sewage by bio aeration and given his experiences in (2) The disposal of the sewage of Calcutta is at a critical stage of discussion and for these reasons it was desirable to ascertain if the Calcutta sewage lent itself to purification by this process

Aspiration of air was used in the laboratory Raw sewage was first aspirated for 24 hours when a small quantity of sludge was formed To this was added new raw sewage and the process continued daily By this means an active sludge was built up and the processes during formation studied

(1) *Chemical Results*

A record of eight weeks' work is given in Chart A An examination of this reveals some interesting points Judged by the oxygen dissolved remaining in a mixture of one part sewage and nine parts water at the end of 24 and 48 hours respectively and by the methylene blue test a very considerable improvement took place at once in the sewage This improvement was, however, not immediately evident in the free ammonia, albuminoid ammonia or the four hours oxygen figure

The free ammonia figure —The figures for this at first are very varied, occasionally the effluent showed higher figures than the crude effluent It is not until the third week that consistently high reductions in this figure are obtained After the seventh week the reduction is consistently high

The albuminoid ammonia figure —Up to the fifth week the results are varying, after the fifth week consistent reductions take place

Four hours oxygen figure —In the beginning there is very little reduction in this figure, the figure of the effluent sometimes being higher than the crude sewage This fact has been previously noted by Temple(2) During the fourth week there is a distinct increase in the figure, from the fifth week onwards there is a reduction in the figure, until in the eighth week this reduction is nearly 80 per cent

Calcutta lately had the opportunity of studying the process under varying conditions :—

(1) At a college with the air diffusion system.

(2) An experimental plant with the surface aeration system, the 'Simplex' type.

(3) In the laboratory, using an aspiration apparatus for aeration.

In (1) a concentrated sewage was used, the plant was worked only while students were in residence, and the compressed air had to be shut off at night. The conditions were therefore a very severe test for any process. As the sludge got ripe, the installation was closed down for the vacation, while the nightly shutting off of the compressed air choked the diffusers.

Nevertheless, a fairly active sludge was obtained and some of the results are detailed in Table I.

(2) In this, the surface aeration system, an experimental plant was installed to deal with the effluent from several septic tanks. The sprinkling aerobic filters previously used had become an intolerable nuisance, so much so that work in the vicinity became an impossibility. Septic tank effluent is not comparable to crude sewage as it has undergone septic digestion for 24 hours. The chemical analysis of the effluent is given in Table II. The installation was started at the rate of two gallons per minute, representing a contact aeration of eight hours; at intervals the rate was increased to three, five, seven and finally nine gallons per minute. The latter figure represented an aeration contact of about 3½ hours. The results of chemical analysis of the effluent are given in the adjoining Table II.

The last two items in the following table give the Local Government standards for chemical purity before a purified septic tank effluent is allowed to flow into any river or tank.

	Dissolved oxygen remaining in mixture of 1, effluent and 9, water.				
	4 hours oxygen.	After 24 hours	After 48 hours	Nitrates.	Methylene blue discharged in
1. Septic Tank Unfiltered Effluent	3·5	·25	·1	*Nil*	..
2. ,, ,, Filtered ,,	1·5	·45	·25	Present	Not in 4 days.
Effluent after 7 hours aeration	·38	·69	..	Present in large quantities	Do.
,, ,, 6 ,, ,,	·38	·63	·62		
,, ,, 5 ,, ,,	·4	·68	·63		
,, ,, 4 ,, ,,	1·5	·62	·59		
,, ,, 3 ,, ,,	1·9	·6	·43	Heavy trace	Do.
,, ,, 2 ,, ,,	2·1	·59	·5	Heavy trace	4 days.

	Crude Effluent	1 0 16	12 18	4 9 2 8	3 5 2 3	1 4 5	*Nil* 39	*Nil* 33	*Nil* *Nil*	*Nil* Heavy trace	1 day Not in 4 days
	Crude Effluent	1 6 065	2 05	4 1 7 2	2 4 2 5	1 7 4 7	*Nil* 42	*Nil* 35	*Nil* V m trace	*Nil* Trace	1 day 4 days
3rd Week	Crude Effluent	1 7 09	22 65	4 9 8 6	2 5 7 7	2 4 9	*Nil* 41	*Nil* 31	*Nil* 2	*Nil* Trace	1 day Not in 4 days
	Crude Effluent	9 008	05 01	4 7 4 7	4 0 4 5	7 2	*Nil* 38	*Nil* 33	*Nil* 1 8	*Nil* Heavy trace	1 day Not in 4 days
	Crude Effluent	1 5 016	2 036	4 7 4 4	3 6 4 0	1 1 4	*Nil* 44	*Nil*	*Nil* 1 7	*Nil* Heavy trace	1 day Not in 4 days
	Crude Effluent	1 0 04	30 05	5 0 7 0	3 8 6 4	1 2 6	*Nil* 49	*Nil* 43	*Nil* 3 5	*Nil* Heavy trace	1 day Not in 4 days
4th Week	Crude Effluent	17 09	065 55	6 3 5 6	2 9 4 8	3 4 5	*Nil* 43	*Nil* 29	*Nil* 3	*Nil* Trace	1 day 4 days
	Crude Effluent	1 2 026	42 04	3 3 7 4	3 1 6 5	2 9	*Nil* 34	*Nil* 29	*Nil* 25	*Nil* Trace	1 day Not in 4 days
	Crude Effluent	1 7 ·024	25 064	2 3 7 2	2 0 6 6	3 6	*Nil* 5	*Nil* 39	*Nil* 5	*Nil* Heavy trace	1 day Not in 4 days
	Crude Effluent	2 1 24	35 14	6 0 4 1	1 4 3 0	4 6 1 1	*Nil* 39	*Nil* 38	*Nil* 8	*Nil* Trace	1 day Not in 4 days
	Crude Effluent	1 5 02	175 068	7 8 3 4	2 4 3 2	5 4 2	*Nil* 52	*Nil*	*Nil* 3	*Nil* Present	1 day Not in 4 days

V m = very minute

CHART A.

Laboratory Experiment.

Date.	Name.	Free ammonia.	Albuminoid ammonia.	Oxygen. 4 hrs. Raw.	Oxygen. 4 hrs. Clarified.	Oxygen. 4 hrs. Colloidal.	Oxygen. 24 hrs.	Oxygen. 48 hrs.	Nitrite.	Nitrate.	Methylene blue discharged in
		Parts per 100,000.									
1st Week	Crude	·72	·1	9·9	8·8	1·1	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	1·0	·07	6·0	5·6	·4	·32	·3	*Nil*	Minute trace	4 days.
	Crude	1·28	·2	8·0	7·4	·6	*Nil*	*Nil*	*Nil.*	*Nil*	1 day.
	Effluent	·6	·09	9·0	6·8	2·2	·57	·41	V. m. trace	Trace	Not in 4 days.
	Crude	2·0	·08	9·5	8·2	1·3	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·25	·06	5·2	2·6	2·6	·42	·28	Minute trace	Trace	Not in 4 days.
	Crude	·96	·32	6·0	5·1	·9	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·025	·01	7·9	3·9	4·0	·47	·17	·06	Trace	Not in 4 days.
	Crude	1·4	·18	5·9	3·1	2·8	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·3	·06	11·0	10·2	·8	·43	·39	·04	Trace	Not in 4 days.
2nd Week	Crude	·04	1·9	4·9	2·7	2·2	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·64	·18	5·0	4·6	·4	·48	·36	V. m. trace	Trace	Not in 4 days.
	Crude	1·2	·16	7·7	5·2	2·5	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·8	·07	5·9	5·5	·4	·8	·53	·2	Heavy trace	Not in 4 days.

	Crude Effluent	1 5	32	5 5 5 0	4 6 4 9	9 100	Nil 42	Nil 39	Nil 1	Nil Present	1 day Not in 4 days
	Crude Effluent	65 024	05 048	3 7 2 8	2 5 1 8	1 2 1 0	Nil 54	Nil 35	Nil Nil	Nil Present	1 day Not in 4 days
	Crude Effluent	1 1 16	04 05	5 9 2 6	2 5 1 6	3 4 1 0	Nil 41	Nil 31	Nil 08	Nil Present	1 day Not in 4 days
7th Week	Crude Effluent	2 3 22	14 08	4 0 1 0	2 4	1 6	Nil 44	Nil 33	Nil Trace	Nil Present	1 day Not in 4 days
	Crude Effluent	55 28	23 12	4 2 1 4	6	8	Nil 64	Nil 47	Nil Trace	Nil Present	1 day Not in 4 days
	Crude Effluent	3 004	11 004	2 2 93	6 79	1 6 14	Nil 47	Nil 46	Nil Minute trace	Trace Present	1 day Not in 4 days
	Crude Effluent	15 04	71 1	4 5 1 2			Nil 58	Nil 44	Nil Minute trace	Nil Present	1 day Not in 4 days
8th Week	Crude Effluent	9 008	32 06	3 2 1 3			Nil 48	Nil 46	Nil Nil	Nil Present	1 day Not in 4 days
	Crude Effluent	1 5 001	13 068	4 6 9	2 9 45	1 7 45	Nil 5	Nil 4	Nil Nil	Nil Heavy trace	1 day Not in 4 days
	Crude Effluent	2 2 13	31 064	6 2 1·2	1 3	4 9	Nil 52	Nil 38	Nil Nil	Nil Present	1 day Not in 4 days
	Crude Effluent	2 2 12	31 056	6 2 1 8			Nil 40	Nil 31	Nil Nil	Nil Present	1 day Not in 4 days
	Crude Effluent	4 084	·12 044	6 0 1 4			Nil 6	Nil 38	Nil Nil	Nil Present	1 day Not in 4 days

CHART A—*contd.*

Laboratory Experiment—contd.

Date.	Name.	Parts per 100,000. Free ammonia.	Albuminoid ammonia.	Oxygen. 4 hrs. Raw.	Clarified.	Colloidal	24 hrs.	48 hrs.	Nitrite.	Nitrate.	Methylene blue discharged in
5th Week	Crude	3·1	·62	6·3	3·7	2·6	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·016	·072	5·4	5·1	·3	·4	·38	·5	Present	Not in 4 days.
	Crude	·24	1·68	5·2	3·0	2·2	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·008	·056	5·0	4·4	·6	·37	·3	·3	Present	Not in 4 days.
	Crude	2·6	·36	6·1	2·6	4·5	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·012	·064	5·5	5·2	·3	·44	·42	·3	Present	Not in 4 days.
	Crude	1·9	·55	5·7	3·8	1·9	*Nil*	*Nil*	*Nil*	*Nil*	4 days.
	Effluent	·01	·028	2·5	1·3	1·2	·52	·4	·3	Present	Not in 4 days.
	Crude	2·0	·52	5·7	2·7	3·0	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·002	·075	5·1	4·1	1·0	·48	..	·15	Present	Not in 4 days.
6th Week	Crude	·041	·32	2·7	2·0	·7	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·021	·008	2·4	2·3	·1	·36	·3	·2	Present	Not in 4 days.
	Crude	1·6	·28	3·9	2·2	1·7	*Nil*	*Nil*	*Nil*	*Nil*	1 day.
	Effluent	·3	·008	2·3	·50	1·7	·50	·39	Trace	Present	Not in 4 days.

These figures (of the four hours) bear a very distinct relation to the nitrite and nitrate figures.

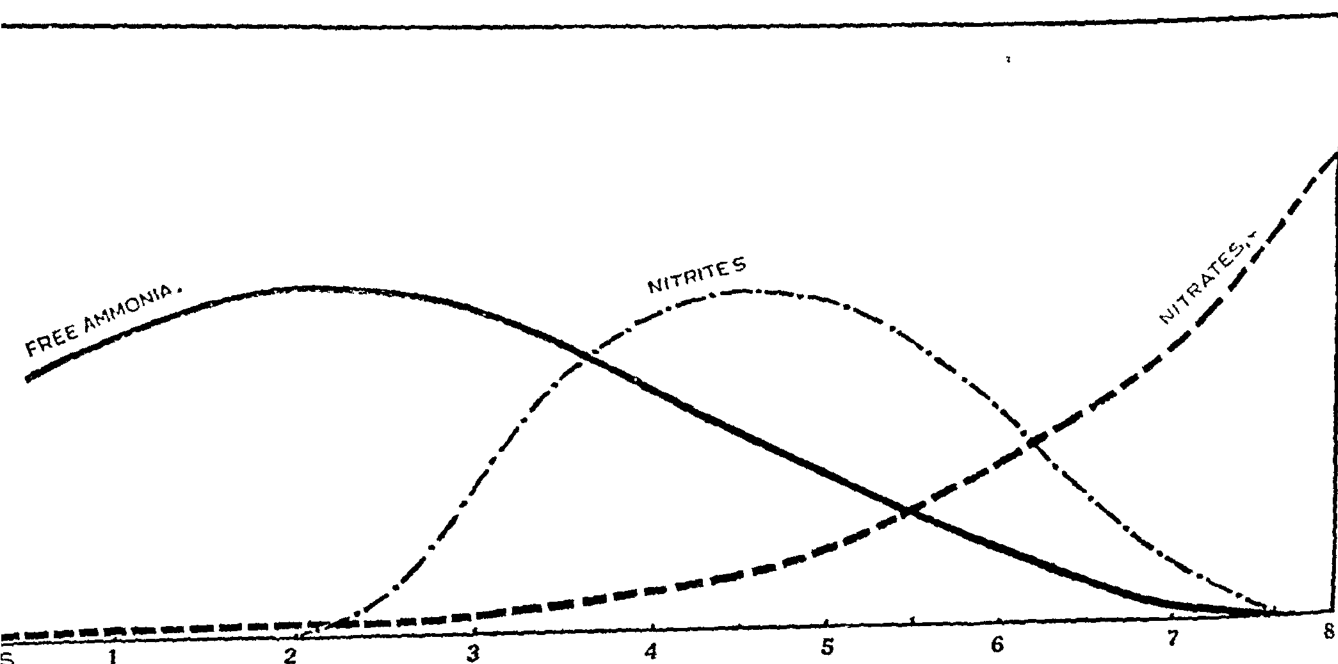
Nitrite.—In the first week there is a little production of nitrite which increases little during the second and third weeks; during the fourth and fifth weeks there is a distinct increase in the *nitrite* reaching a maximum of ·8 per 100,000. From this point onwards there is a gradual fall *in the amount* of nitrite present until in the seventh and eighth weeks *nitrites are* absent.

Nitrates.—At first there is very little nitrate formation. In the fourth and fifth weeks there is a trace while in the seventh and eighth weeks the nitrates are abundantly present. Eight weeks therefore represents the minimum time in this experiment for the formation of an active sludge producing complete nitrification. These chemical changes point to a distinct sequence of events. At first there is a large formation of free ammonia with little or no nitrites or nitrates.

In the fourth *and fifth* weeks the free ammonia has diminished but the nitrites have increased very distinctly; nitrates are scantily present.

In the later weeks the free ammonia is very small in amount, there are no nitrites while nitrates are abundantly present. These may be represented diagrammatically thus :—

GRAPH I.



These progressive changes are a valuable index of the activity of the sludge. We find corroboration in the examination of the bacteria present. At first ammonia forming bacteria are present with few nitrite formers and no nitrate formers.

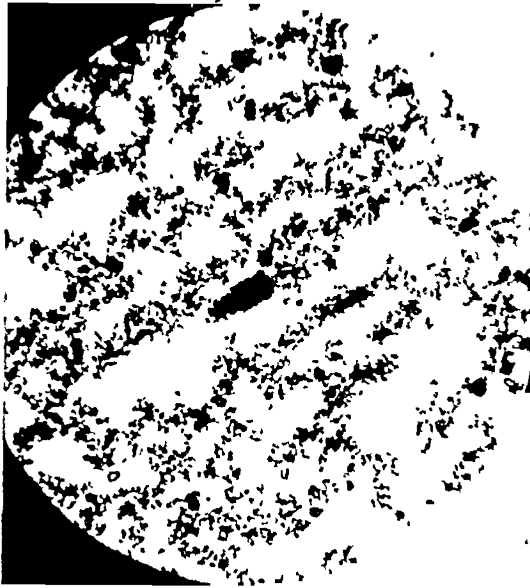
In the fourth and fifth weeks the nitrite formers predominate, though nitrate formers are also present.

The rate of chemical purification of Calcutta raw sewage using 15 per cent of an active sludge, has been studied aspirating for one, two three four five six and seven hours The chemical results are given in Chart B

The percentage purification based on albuminoid ammonia and the four hours oxygen figure are given in Graph II These show that after one hour aeration there is a 56 per cent purification in the albuminoid ammonia and 63 per cent in the four hours oxygen figure After two hours the figures are 63 per cent and 71 per cent At three hours both are the same viz 72 per cent This represents maximum purification figures Between third and fourth hours the albuminoid ammonia purification proceeds rapidly, the four hours figure less so At four hours aeration the albuminoid ammonia purification is 98 per cent and the four hours oxygen figure 86 per cent Five hours or longer aeration gives a purification of 99 per cent and 90 per cent respectively in the albuminoid and the four hours figure Further aeration produces practically no further chemical purification The effluent is clear and absolutely inoffensive

Calcutta sewage therefore at its outfall from the city could easily be purified with four hours aeration with an active sludge It is to be remembered that Calcutta sewage is comparatively weak and has undergone a certain amount of anaerobic decomposition by the time it reaches its outfall and in this respect resembles the septic tank effluent in Experiment 1

The appearances of good active sludge are distinctive It is of chocolate brown colour and particulate masses are discernible to the naked eye When shaken not too violently in water it should settle quickly and after one hour sedimentation should be complete the upper layers clear and a sharp line of demarcation between sludge and fluid Microscopically finely granular masses are seen in definite collections the intervening spaces under the low power are clear and free of sedimented matter and even with a high power few bacteria are seen in these spaces (*see* Plate XLVII fig 1) The presence of particles of fine sediment the appearance of a grey flocculation or black granules are signs of poor activity or invasion by one of the sewage fungi These latter are constant inhabitants of septic tank sludge and may seed themselves in the installation and cause serious trouble by interfering with settlement and by coming over with the effluent (causing in fact what is known as bulking) The grey flocculation is due to a cladothrix fungus composed of very fine threads It may exist in a sludge which is giving good results and may interfere only mechanically When aeration is deficient however, it replaces the sludge almost entirely and purification practically stops Efficient aeration and satisfactory arrangements for settlement of the effluent after aeration are the best means of combating this fungus (*see* Plate XLVII fig 2) The black granulation' is due to one of the beggiatoa' group which secretes sulphur granules which later combine with the iron in the water Coils of fungus impregnated with iron sulphide form the black masses seen in the sludge (*see* Plate XLVIII fig 3) The appearance of this fungus is a serious hindrance both to the formation of an active sludge and to purification Prolonged aeration gets rid of it to some extent,



No. 1.
Photograph of a mature sludge showing clear intervening spaces.



No. 2.
Photograph of deteriorated Lillooah sludge showing fungi.

Crude Effluent after 3 hrs aeration	1 2 88	36 108	10 5 4 0	1 0 1 0	9 5 3 0	*Nil* 6	*Nil* 36	*Nil* Trace	*Nil* Present	3 hours Not in 4 days
Crude Effluent after 3 hrs aeration	1 5 32	48 07	4 3 1 4	8 2	3 5 1 2	V M trace 58	*Nil*	*Nil* Present	*Nil* Trace	12 hours Not in 4 days
Crude Effluent after 4 hrs aeration	1 0 2	2 0 064	4 6 1 9	1 1 1 5	3 5 4	*Nil* 55	*Nil* 53	*Nil* Present	*Nil* Present	12 hours Not in 4 days
Crude Effluent after 4 hrs aeration	1 0 06	2 0 044	4 6 1 5	1 1 1 1	3 5 4	*Nil* 62	*Nil* 59	*Nil* 026	*Nil* Present	12 hours Not in 4 days
Crude Effluent after 4 hrs aeration	7 008	8 ·07	9 8 1 8	1 9 49	7 9 1 31	*Nil* 69	*Nil* 55	*Nil* *Nil*	*Nil* Present	12 hours Not in 4 days
Crude Effluent after 5 hrs aeration	1 0 008	2 0 03	4 6 1 0	1 1 77	3 5 23	*Nil* 64	*Nil* 62	*Nil* *Nil*	*Nil* Present	12 hours Not in 4 days
Crude Effluent after 5 hrs aeration	1 0 02	2 0 018	4 6 37	1 1 37	3 5 *Nil*	*Nil* 68	*Nil* 64	*Nil* *Nil*	*Nil* Present	12 hours Not in 4 days
Crude Effluent after 5 hrs aeration	1 0 008	34 06	3 0 4	74 4	2 26 *Nil*	28 7	*Nil* 63	*Nil* *Nil*	*Nil* Present	24 hours Not in 4 days.
Crude Effluent after 6 hrs aeration	1 6 02	32 07	3 1 7	1 2 7	1 9 *Nil*	27 65	V m trace 63	*Nil* *Nil*	*Nil* Pt in large excess	24 hours Not in 4 days
Crude Effluent after 6 hrs aeration	1 2 12	36 06	10 5 8	1 0 7	9 5 1	*Nil* 62	*Nil* 63	*Nil* *Nil*	*Nil* Pt in large excess	3 hours Not in 4 days
Crude Effluent after 6 hrs aeration	1 9 056	7 07	4 5 38	2 0 38	3 5 *Nil*	*Nil* 63	*Nil* 62	*Nil* V m trace	*Nil* Present	2 hours Not in 4 days
Crude Effluent after 6 hrs aeration	1 5 008	5 03	4 3 4	8 2	3 5 2	V m trace 63	*Nil*	*Nil* *Nil*	*Nil* Pt in large excess	12 hours Not in 4 days

Pt = present
M = minute
V m = very minute

CHART B.

Laboratory Experiment.

Date.	Name.	Free ammonia.	Albuminoid ammonia.	Oxygen. 4 hrs. Raw.	Oxygen. 4 hrs. Clarified.	Oxygen. 4 hrs. Colloidal.	Oxygen. 24 hrs.	Oxygen. 48 hrs.	Nitrite.	Nitrate.	Methylene blue discharged in
		Parts per 100,000.									
25-8-27	Crude	1·05	·27	7·5	1·8	5·7	*Nil*	*Nil*	*Nil*	*Nil*	12 hours.
	Effluent after 1 hr. aeration	·32	·13	2·6	1·4	1·2	·55	·5	Trace	Trace	4 days.
26-8-27	Crude	·36	·13	2·6	·7	1·9	·45	·3	*Nil*	*Nil*	2 days.
	Effluent after 1 hr. aeration	·15	·09	2·3	1·8	·5	·61	·51	Trace	Heavy trace	Not in 4 days.
27-8-27	Crude	1·5	·16	5·7	·7	5·0	*Nil*	*Nil*	*Nil*	*Nil*	24 hours.
	Effluent after 1 hr. aeration	·70	·07	2·5	1·4	1·1	·52	·48	Trace	Heavy trace	Not in 4 days.
	Crude	1·05	·27	7·5	1·8	5·7	*Nil*	*Nil*	*Nil*	*Nil*	12 hours.
	Effluent after 2 hrs. aeration	·3	·13	2·1	1·2	·9	·6	·52	Trace	Heavy trace	4 days.
	Crude	·36	·13	2·6	·7	1·9	·45	·3	*Nil*	*Nil*	2 days.
	Effluent after 2 hrs. aeration	·14	·06	1·9	1·5	·4	·64	·51	Heavy trace	Heavy trace	Not in 4 days.
	Crude	1·5	·16	5·7	·7	5·0	*Nil*	*Nil*	*Nil*	*Nil*	24 hours.
	Effluent after 2 hrs. aeration	·18	·06	1·8	·95	·85	·57	·5	Trace	Heavy trace	Not in 4 days.
8-9-27	Crude	2·1	·3	5·1	1·9	3·2	*Nil*	*Nil*	*Nil*	*Nil*	12 hours.
	Effluent after 3 hrs. aeration	·64	·16	2·5	1·4	1·1	·52	·4	Heavy trace	Present	Not in 4 days.
	Crude	1·3	·26	2·8	1·9	·9	·27	M. trace	*Nil*	*Nil*	12 hours.
	Effluent after 3 hrs. aeration	·4	·08	1·7	1·0	·7	·60	·44	Trace	Present	Not in 4 days.
	Crude	1·6	·32	3·1	1·2	1·9	·27	M. trace	*Nil*	*Nil*	24 hours.
	Effluent after 3 hrs. aeration	·4	·08	1·2	1·04	·16	·6	·52	Trace	Present	Not in 4 days.

PLATE XLVIII



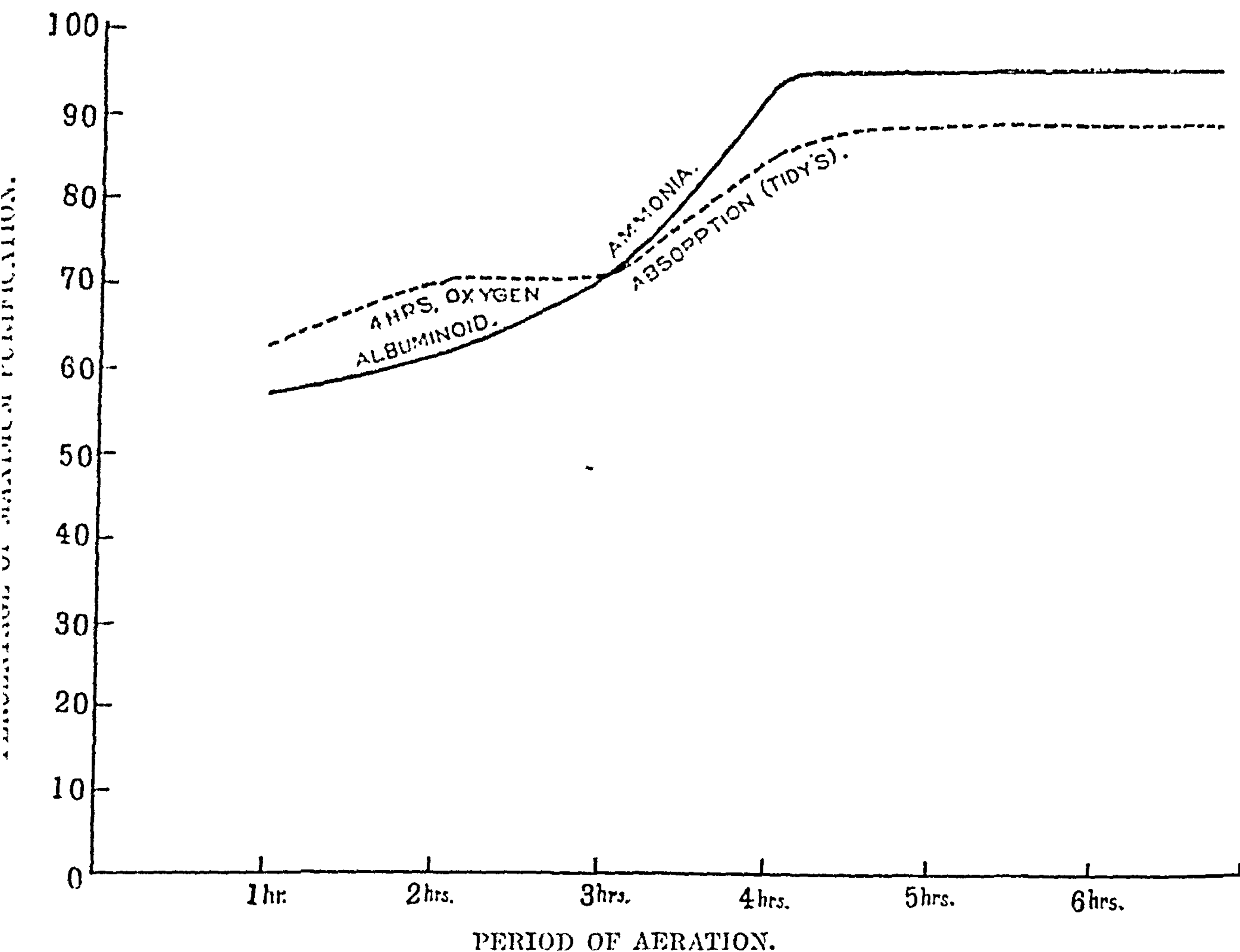
No. 3.
Photograph of a deteriorated (due to fungal growth) sludge showing black masses



No. 4.
Photograph of fungi (one of the 'beggia toa' group) cultured from activated sludge. These fungi exert a deleterious action on the sludge and, coiled up together, form the black masses of the sludge.

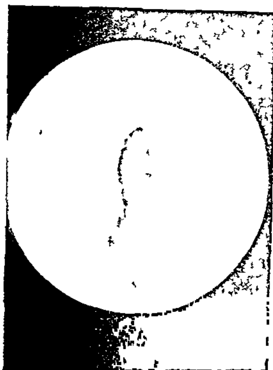
but in a sludge seriously infected the only method we have found efficient is to clear out the sludge, and start afresh with an effluent free of the fungus. This organism is easily cultivated and in cultures shows the typical 'coiling,' forming the granular masses found in infected sludge (*see* Plates XLVIII, XLIX, figs. 4 and 5).

GRAPH II.



(2) *Protozoal Findings.*

In the preparation of sludge in the laboratory, the first stages are marked by a very rapid and prolific growth of all forms of elementary life. Amœbæ, spirochætes, flagellates and ciliates are abundant and contribute the greater bulk of the material. As sludge formation goes on, the smaller forms practically disappear until only a few of the larger ciliates are present, chiefly paramœcium, vorticella, carchesium, coleps, prorodone and aspidiscis. These are usually associated with a good active sludge, though vorticella and carchesium are apt to cause bulky flocculation. Protozoa, however, are often scanty or absent in a sludge giving quite good results. The appearance of rotifers and worms is usually associated with a sludge giving indifferent results especially in indifferent flocculation. We



No 5

Photograph of coiled up fungi (one of 'beggiatoa' group) cultured from deteriorated activated sludge This coiled up mass impregnated with iron sulphide forms the black masses seen in the sludge



No 6

Photograph of nitrite forming organism (Nitrosomonas)

ere at first under the impression that protozoa played an important part in ctivation, but this does not appear to be the case.

(3) *Bacterial Findings.*

Liquid and solid media were used for the isolation of these organisms Particulars of the preparation are given in Appendix A Chemical tests for the presence of free ammonia, nitrites and nitrates were applied Generally speaking ammonia producing organisms were present in abundance at the beginning of the process of preparation of sludge, nitrite organisms were present in small amounts at the beginning, rapidly increased in the four or five weeks and continued to be present thereafter Nitrate formers were later in appearing (sixth, seventh and eighth weeks) These results correspond to the evidence of purification determined by chemical methods The colonies obtained on solid media in the case of nitrite forming organisms were at first greyish white and later brownish Some remained white throughout The colonies examined with a lens are roundish granular masses, with distinct irregular spreading edges The organisms themselves from the colonies are small cocco bacillary rods non-motile and gram positive Chains are occasionally seen (*see* Plate XLIX fig 6) No 'swarming stage' as described by Jordan and others was observed This is in agreement with other observers in the East In the case of nitrate forming organisms, the colonies are transparent like dew drops and very small (*see* Plate L, fig 7) In raw Calcutta sewage, nitrite and nitrate forming organisms are present in 01 c c In activated sludge they can be detected in 0000001 c c, the liquid media giving a positive result on the tenth day

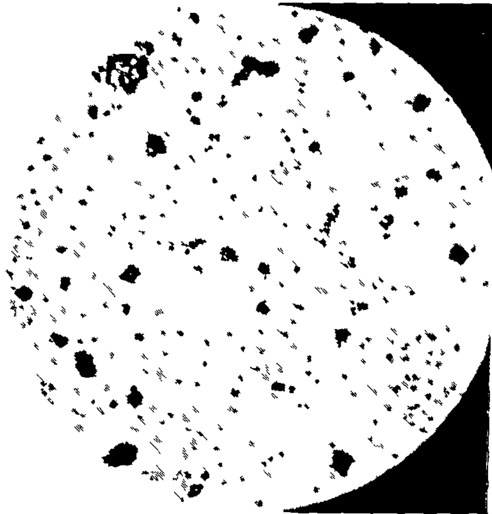
There seems little doubt that these organisms are the active agents in the chemical purification of the sewage by this method The reductions in the numbers of *B coli* is one of the features of this process

With an active sludge present in 15 per cent volume, we found the following result with Calcutta sewage —

1 hour aerated *B coli* present in	000001 c c	No improvement noticed
2 „ „ „ „	00001 c c raw sewage 0001 c c effluent	90 per cent
3 „ „ „ „	000001 c c raw sewage 001 c c effluent	99 per cent
4 „ „ „ „	000001 c c raw sewage 0001 c c effluent	99 per cent
5 „ „ „ „	000001 c c raw sewage 001 c c effluent	99 9 per cent
6 „ „ „ „	000001 c c raw sewage 001 c c effluent	Nearly 100 per cent
24 „ „ „ „	000001 c c raw sewage 01 c c effluent	

With the surface aeration plant, 90 per cent reduction was achieved in
' aeration.

PLATE L.



No. 7.
Photograph of nitrate forming organism.

The chemical analyses in this investigation have throughout been carried out by Mr N K Chatterjee, B sc, Assistant Analyst in the Bengal Public Health Laboratory, and the bacterial examinations by Dr Ghosal, Assistant Professor of Public Health, Laboratory Practice To both of these gentlemen I am greatly indebted, not only for their technical assistance, but also for their interest in the work

REFERENCES

(1) MARTIN ARTHUR J (1923 24) Bio aeration of Sewage *Proceedings Inst C E* Vol CCXVII

Do The Activated Sludge Process

(2) *The Journal of the Institution of Engineers (India)* Vol V April 1925

(3) SEARLE Colloids in Medicine

(4) STEWART A D and GOBINDA RAJU V (1924) Some further observations on the species method of differentiating fæcal organisms in surface waters in the tropics *Ind Jour Med Res*, April

APPENDIX A

(1) *Liquid medium for nitrite forming organisms* :—

Ammonium sulphate	1 grm	The solution is tubed and sterilized in autoclave Magnesium carbonate is added in excess at the time of inoculation
Potassium phosphate	1 ,,	
Magnesium sulphate	5 ,,	
Sodium chloride	2 ,,	
Ferrous sulphate	4 ,,	
Distilled water	1000 c cs	

(2) *Liquid medium for nitrate forming organisms* —

Sodium nitrite	1 grm	The solution is tubed and sterilized in autoclave
Potassium phosphate	5 ,,	
Magnesium sulphate	3 ,,	
Soda (water free)	1 ,,	
Sodium chloride	5 ,,	
Ferrous sulphate	4 ,,	
Distilled water	1000 c cs	

Different dilutions of sewage or activated sludge or its effluent as the case may be are put into tubes and tests for nitrite and for nitrite forming organisms and for nitrate in case of nitrate forming organisms are made generally from f th day A control was made in each case

(3) *Solid medium for nitrite forming organisms* —

The method advocated by Stevens and Temple in *Centrablat F Bakt* II A B T B D XXI, No 13 (page 86) is satisfactory

The percentage of silicic anhydride in *the sample of sodium silica to be used* is first determined The silicate is *then diluted till the solutions cont n four to five per cent of silicic anhydride Then hydrochloric* acid of such stren th *is prepared*

These results contrast very favourably with aerobic filtration where the coli reduction is practically nil.

The cause of this destruction of coliform organisms is not known, some have ascribed it to protozoal or enzyme action but there is no direct evidence of the causes. A bacteriophage may be present and this is at present being investigated.

B. coli are not only reduced in numbers, but there is also a change in the proportion of species present. Clemesha's classification has been followed, i.e., according to their power of resistance. Class I is the least resistant and includes the classical *B. coli*. Class II is intermediate and Class III is the most resistant. It was found after 24 hours' aeration that Class I type disappears to a great extent, Class II type also is reduced whereas the percentage of Class III type increases.

The following table shows the percentage of these classes in raw sewage and in the purified effluent :—

	Raw Sewage.	*Effluent.*
Class I	8 per cent.	3 per cent.
Class II	80 ,, ,,	59 ,, ,,
Class III	12 ,, ,,	38 ,, ,,

It is evident that the activated sludge exerts a very distinct purifying action by which pathogenic bacilli (which are not resistant and are high up in Class I) are destroyed.

Hydrogen-ion Concentration.

There is not much time to go into the various theories of the actions of activated sludge, but we may just touch on the question of hydrogen-ion concentration. The process is a combination of precipitation of colloids plus bacterial and enzyme action. The precipitation of colloids is effected in other processes by the addition of positive ions such as iron and aluminium. Searle(3) is of opinion that the agitation of sewage with air results in a positive electrification with consequent precipitation of the negatively charged colloids.

We have made several examinations of the pH of raw Calcutta sewage and sewage, both after simple aeration and after treatment with activated sludge.

The raw sewage gave a pH between 7·6 and 7·8 practically always; after aeration the pH was approximately always 8·2 and after activated sludge treatment 8 to 8·2. These results are rather puzzling and do not seem to support the contention that a decrease in pH is a necessary preliminary to precipitation of colloids in the activated sludge processes.

Analysis of the Sludge.

Good active sludge dried gave the following analysis :—

Organic matter	26·6 per cent.
Inorganic matter	73·4 ,, ,,
Total nitrogen	1·9 ,, ,,
P_2O_5	0·24 ,, ,,

POPULATION AND PUBLIC HEALTH IN INDIA

BY

LIEUT COL A J H RUSSELL C B E M A, M D, D P H, I M S
Director of Public Health Madras

INTRODUCTION

Of all Eastern countries, India is particularly liable to extensive outbreaks of epidemic disease and suffers, in addition, from frequently recurring periods of famine or scarcity From time to time cholera breaks out with great virulence and epidemics of smallpox periodically cause a heavy mortality Epidemic fevers have repeatedly devastated parts of Bengal Kala azar has, for years past wrought great havoc in Assam, and in the decade 1901 to 1911 malarial fever decimated the irrigated tracts of the eastern and central Punjab and the Ganges Jumna Doab in the United Provinces where, in 1908 alone the reported mortality from fevers was about two millions India has also suffered severely from the ravages of plague the recorded plague deaths numbering nearly 11 millions since its introduction into Bombay in 1896 Still more recently, sudden and severe outbreaks of relapsing fever have been experienced in different parts of the country

Famines were not unknown in ancient India nor were they rare under Mohammedan rule Thanks to the development of railways and irrigation they have now become less frequent and less severe but in the 50 odd years from 1871 several occurred, much the most serious being that of 1876 77 In discussing the question of recurrence of famines the Indian Famine Commission said "A very long period elapsed before the conviction was attained that Indian famines are necessarily recurring calamities against which such precautions as are possible must be taken beforehand and that it is the duty of the Government to do its utmost in devising some means of protecting the country, and to persevere in its attempts till some solution of the problem has been obtained This result was no doubt due to the almost total absence, until within comparatively recent times of trustworthy statistical knowledge as to the numbers of the people, the rates of their deaths and births and the influence on these rates of epidemic disease or local distress combined with an equally insufficient insight into their economic condition, and particularly an absence of agricultural statistics in an accessible form We fear that even yet the vast importance of knowledge of this description is but imperfectly appreciated in many quarters"

Great numbers of people, therefore, die each year from epidemic diseases and public health departments of this country are compelled to spend a

so that 1 c.c. of it exactly neutralizes 1 c.c. of sodium silicate solution. Methyl orange is used as an indicator. Then 105 c.cs. of the acid solution is taken and to it is added 100 c.cs. of sodium silicate solution slowly, with constant stirring. The excess of acid is taken to prevent coagulation during sterilization. The solution is now tubed and sterilized. The solution of silicic acid thus prepared constitutes the basis of the media. To each tube 1 c.c. of concentrated nitrite medium is added which contains enough sodium carbonate to make the excess of acid in the base slightly alkaline. Then in each case 1 c.c. of activated sludge or the effluent or sewage as the case may be is inoculated into the tube along with the nitrite medium containing sodium carbonate. Within a few minutes solidification takes place.

(4) *Solid medium for nitrate forming organisms :—*

Two and a half per cent of agar is added to the liquid medium and tubed. At the time of inoculation the agar is melted and then cooled down to 40°C. when the material is put into the tube and the whole poured in a sterile Petri dish.

DISCUSSION.

Dr. R. V. Norris (Mysore, B. India) : At the Indian Institute of Science, Bangalore, an activated sludge plant has been in operation for about five years. The tank is of 6,000 gallons capacity and deals with the raw sewage of the population residing on the Institute estate. Aeration is by means of the diffuser method. The results obtained in general confirm those described by Col. Stewart and the system has been found very satisfactory indeed. When the plant was just started about six weeks were required to build up an active sludge. On subsequent occasions when the tanks have been emptied and re-started, the time required has been much shorter. Only a few difficulties have been met with (1) ' bulking ' which, however, can generally be prevented by efficient aeration, and (2) occasional excessive growth of chironomus larvæ. The latter collect the sludge round them and large quantities of sludge may be lost in this way. Treatment with kerosene oil readily solves this difficulty in a small installation, the larvæ being destroyed. Observation on the bacterial and protozoal population of the tank agree with those described by Col. Stewart. Satisfactory effluents have been obtained throughout with a minimum of attention.

practised in order to restrict numbers Through the mediæval ages, the same methods were used, and, when they were abandoned in Europe, postponement of marriage helped to maintain restriction

Sir Walter Raleigh considered that the earth would overflow with human beings were it not for the effect of hunger, pestilence, crime and war, and of abstinence and artificial sterility Johann Peter Sussmilch one of Frederick the Great's military chaplains, was the first to draw inferences regarding population from the study of vital statistics using for this purpose data collected by various English and German writers during the latter half of the seventeenth century Benjamin Franklin in 1751, published his 'Observations concerning the increase of mankind and the peopling of countries' His conclusion was that Europe was almost fully peopled and could increase but little and slowly

In 1798 Malthus wrote his well known book on the population problem in which he attempted to show that the cause of human misery was the tendency of mankind to increase faster than the means of subsistence His argument is summarized in the following words 'Through the animal and vegetable kingdoms, Nature has scattered the seeds of life abroad with the most profuse and liberal hand, but has been comparatively sparing in the room and nourishment necessary to rear them The race of plants and race of animals shrink under this great restrictive law, and man cannot by any efforts of reason escape from it (23) Population has a constant tendency to increase beyond the means of subsistence The ultimate check to population appears then to be a want of food arising necessarily from the different ratios according to which population and food increase But this ultimate check is never the immediate check except in cases of actual famine '(23)

Unfortunately for the human race the essential validity of the Malthusian principle has not yet been refuted, and the problem which Malthus Ricardo and Mill discussed, still remains unsolved, although its importance has within recent years been more widely recognized Various attempts have been made to demonstrate the many implications involved in unrestricted growth of population, but, so far as we are aware, none of these has dealt specifically with India

Population Growth Curve

In order to determine whether India and her provinces are over populated, and whether her cities are nearing their maximum population, it is necessary to know how and at what rate the population is growing To depict such growth and to be able to predict future populations, the population growth curve used by Dr Raymond Pearl has been used The general equation of this population growth curve is

$$y = \frac{k}{1 + e^{a_0 + a_1 x + a_2 x^2 + \dots}}$$

disproportionate part of their time and energy in the control of these epidemics whose severity is often enhanced by drought and lack of sufficient food.

'Just here is where arises the necessity of evaluating public health activities.' No one engaged in these activities can afford to neglect this phase of his subject, or to take up the attitude that it is none of the public's business to inquire whether his work is worth what it costs. 'Do the measures we practise really prevent disease? Or would the course of morbific events be much the same if some of the things we do were *not done* ?'(1) It is important, therefore, to cry 'halt' at reasonable intervals in order to take stock of the position. In such stock-taking, we must review not only the accomplishments of the past and the advantages of the present, but also possible plans for the future.

The statistical evaluation of public health activities furnishes one of the most potent means we possess of increasing and extending knowledge in this field, because when properly handled it makes possible the measurement of their effectiveness. It must be remembered, however, that 'the day has passed when the mere tabulation of crude statistics, and the drawing of unchecked and uncriticized conclusions from these tabulations will pass the court of scientific judgment.' For example, the reporting of cases of communicable diseases and their collection and tabulation are procedures often carried out without method, purpose or vision.

A strictly scientific evaluation of the results of public health activities is, however, beset with many practical difficulties. Along what lines should this evaluation proceed; in terms of mortality or of finance?

A universally approved activity may result in waste of effort, time and money, if it is not carried through with inspiration. Instances of the kind are too numerous to need mention. Is it possible, for instance, to measure the social worth of a campaign against hookworm disease in terms of money? 'What this work accomplishes is not primarily a reduction in mortality, but a positive increase in the sum total of human happiness and well-being individual, social and economic.'(1)

These questions have been asked in order to emphasize the fact that the fundamental problem of the future of India is one associated with population. The problem of population is, in fact, of far more importance to the economic progress of India than has so far been admitted. Few realize that India is a densely crowded country, where each individual, consciously or unconsciously, is already challenging the right of every other individual to existence. By every present indication, the time is not far distant when pressure of population will constitute a definite danger to all advance.

THE POPULATION PROBLEM IN INDIA.

The problem of population is no new one. It has interested thinkers since the dawn of civilization. Fear of over-population must have played a great part in originating the custom of infanticide among the ancient Greeks and Romans. Carr-Saunders(7) has collected a mass of evidence to prove that among primitive races abortion, infanticide or prolonged abstention from intercourse were everywhere

If there is an upper limit to the growth of a population, then the rates of growth for values of y nearer k will become less and less In other words, we have—

$$\frac{dy}{dx} = k_1 (k-y) y \quad . \quad . \quad . \quad . \quad . \quad . \quad (\text{i})$$

Which represents the differential equation of the growth of a population in a given area

Integrating (i), we get

$$\int \frac{dy}{y(k-y)} = \int k_1 dx$$

or,

$$\frac{my}{k-y} = e^{k\int f(x)\,dx}$$

or,

$$y = \frac{k}{1+me^{-k\int f(x)\,dx}} \qquad (\text{ii})$$

Which may be written as—

$$y = \frac{b}{c+e^{F(x)}}$$

Where,

$$F(x) = -k \int f(x)\, dx$$

$$k = \frac{b}{c}$$

$$\text{and } m = \frac{1}{c}$$

When $F(x)$ is expanded by Taylor's series, the equation takes the form—

$$y = \frac{b}{c+e^{a_1x+a_2x^2+}}$$

In curve fitting sufficient accuracy is usually obtained by restricting $F(x)$ to its first term, viz, a_1x The final simple form of the curve thus becomes—

$$y = \frac{b}{c+e^{-ax}}, \text{ where } -a = a_1 \quad . \quad . \quad . \quad (\text{iii})$$

Constants of the Curve —This equation, having three unknowns, requires three pairs of values of x and y for determination of the constants If these points, for the sake of simplicity, be taken as (o, y_0), (x_1, y_1) and $(2x_1, y_2)$, the constants are given by—

$$(\text{i})\ \frac{b}{c} = \frac{2y_0y_1y_2-y_1^2(y_0+y_2)}{y_0y_2-y_1^2},$$

$$(\text{ii})\ log\ c = -\ log\ \frac{k-y_0}{y_0},$$

$$\text{and (iii) } a = -\frac{1}{x}\ log\ \frac{y_0(k-y_1)}{y_1(k-y_0)} - log_{10}e.$$

By fitting the simplest form of this equation to census figures, Pearl proved that the population growth of all European countries and of Japan could be adequately represented. He has applied the equation to the most diverse population groups, and 'the diversity is of many sorts including extreme racial differences; differences of cultural development, all the way from low agricultural and even hunting stages to the most highly developed urban industrialization; differences in respect of irrigation, in and out of the group dealt with, and differences of absolute size.'(1)

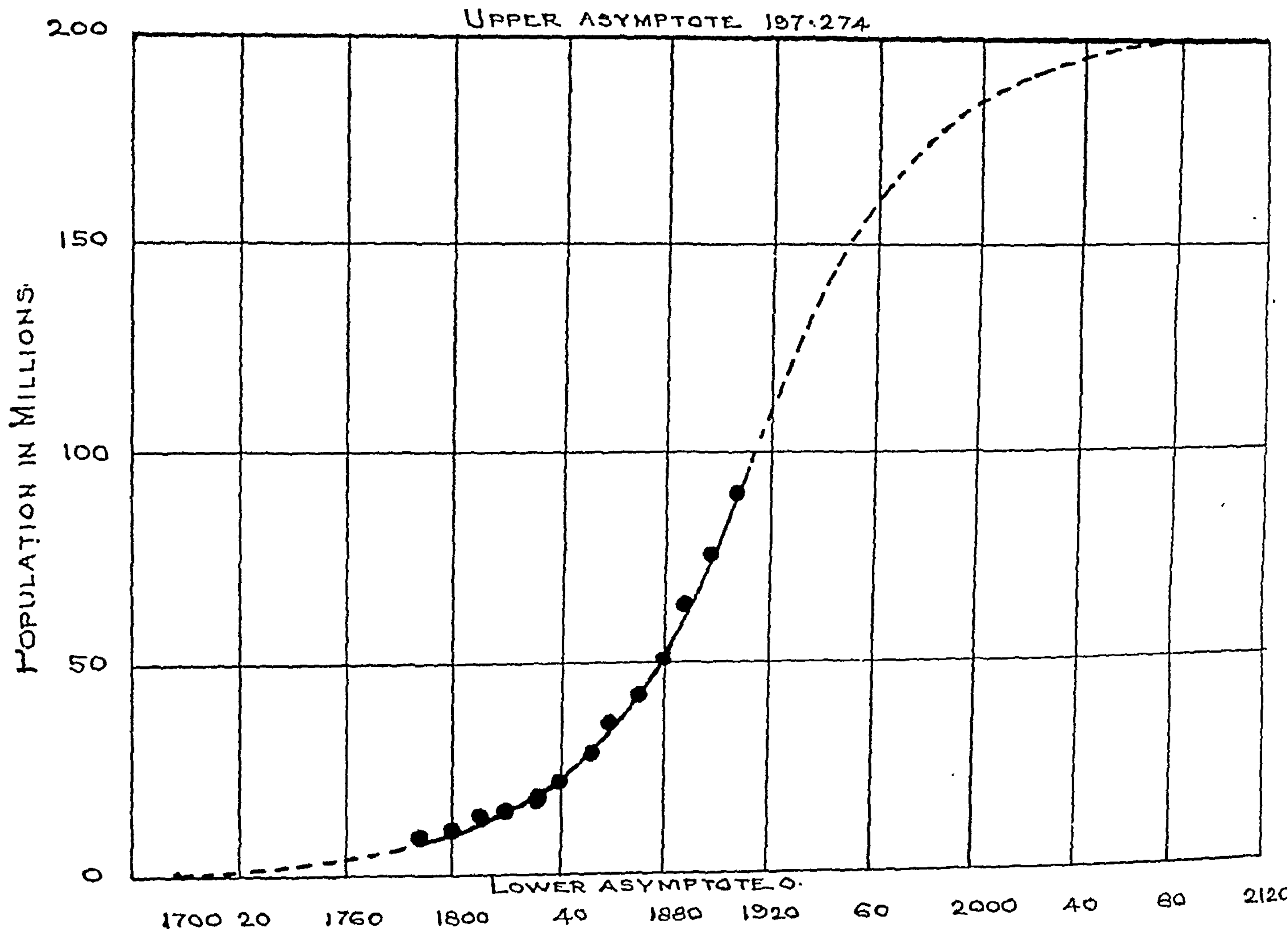


Fig. 1. Population Growth Curve of the United States.

Equation of the Growth Curve.—In obtaining the equation of this curve, the reasoning used was somewhat as follows:—

If y represents the population of a politically defined unit of territory, and x indicates time, then $\frac{dy}{dx}$=rate of change of population. A reasonable assumption is that this rate is proportionate to the population, i.e., $\frac{dy}{dx}=k_1 y$, where k_1 may be assumed to be a function of x.

and, in some cases, show large deviations from the theoretical curve, the values of the upper asymptotes are also only approximate.

All-India.

The six census counts give the following figures for the population of India since 1871 :—

1871	206,162,360
1881	253,896,330
1891	287,314,671
1901	294,361,056
1911	315,156,396
1921	318,942,480

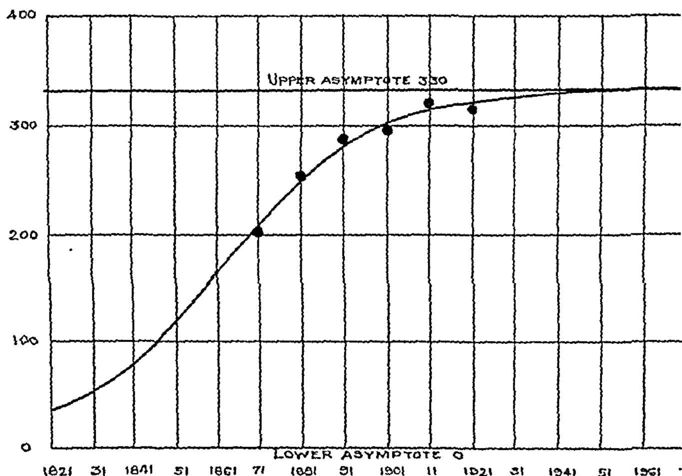


Fig. 2. Population Growth Curve of All India.

The equation of the growth curve fits the census figures very closely.

$$y = \frac{103{\cdot}125}{3{\cdot}125 + e^{-[illegible]x}}.$$

By selecting approximate trend values, the constants a, b, c can be roughly determined, and in order to get a better fit the following equations are used :—

$$bn - c\Sigma y + h\Sigma xye^{-ax} = \Sigma ye^{-ax}$$
$$b\Sigma y - c\Sigma y^2 + h\Sigma xy^2e^{-ax} = \Sigma y^2e^{-ax}$$
$$b\Sigma xye^{-ax} - c\Sigma xy^2e^{-ax} + h\Sigma x^2y^2e^{-ax} = \Sigma xy^2e^{-2ax}$$

Application of the Growth Curve to All-India and to Certain Presidencies and Cities.

In any attempt at applying this population growth curve to Indian provinces and cities, the following limitations must be kept in mind :—

(*i*) The frequent visitations of plague, cholera and other epidemic diseases,
(*ii*) The occurrence of famine ;
(*iii*) The scanty figures available for study, and
(*iv*) The degree of reliability of the available data.

Ordinarily the only available figures are the six decennial census counts which have been taken since 1871. Broadly speaking, the census figure for 1881 was gravely affected by the great Indian famine of 1876 to 1878, and that of 1921 by the influenza pandemic of 1918. Lack of trained workers also made the figures for the first census of 1871-72 of doubtful accuracy.

Regarding the accuracy of the census figures for all-India, Gait observed in 1911 : 'Apart from the additions due to the enumeration of new areas, which can be definitely ascertained, there has been a further, but less easily recognizable gain resulting from the relatively greater accuracy of the later enumerations. It is known that in many places the census of 1872 was very imperfect, while even in 1881 though a very great improvement was effected, there were still numerous omissions. Since then a high standard of accuracy has been obtained and although improvements have still been effected at each succeeding census, they have had comparatively little effect when considered from the point of view of the total population.'(30) In spite of these limitations, the figures used in this paper may be taken as fairly reliable. The population counts for the cities of Bombay, Madras and Madura are without doubt approximately accurate, whilst the error in those for the provinces of Madras and Bombay may be ignored for all practical purposes.

Applying the curve to Indian census figures, the values of a, b and c were obtained as approximations. The method of second approximations could not be used, because the original data were so meagre that the formation of normal equations was not justified. For a similar reason, the probable errors of the constants were not computed. The curves given below are, therefore, at best, only approximations of the trend of population growth. Since in nearly every case the few observed points lie at the extreme end, or in a small part of the centre, of the curve,

These factors all help to account for the irregularity of the census figures for this province, which are as follows —

1872	23,099 332
1881	23,432 431
1891	26,960 421
1901	25,468,209
1911	27,084,317
1921	26 757 648

Although the application of the growth curve was relatively difficult owing to the irregular distribution of the figures an approximate idea of the population growth can be got by fitting a curve which steers a mid course through the census points By trial and error, the best fitting curve was found to be represented by the equation—

$$y = \frac{173\ 33823}{6\ 22243 + e^{-0\ 040551 x}}$$

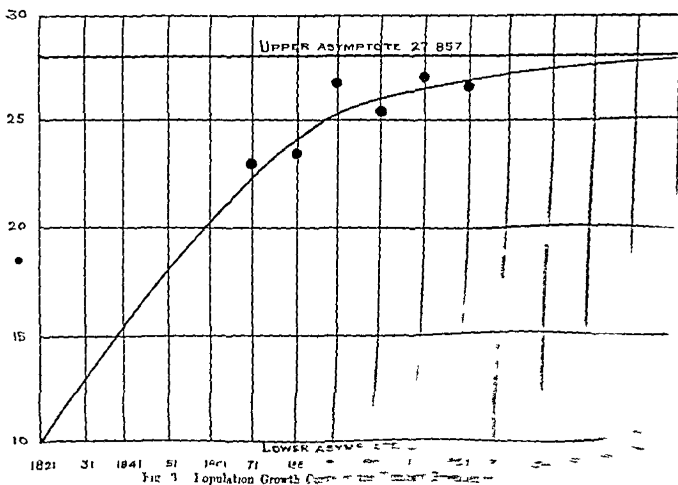


Fig 3 Population Growth Curve [illegible]

Extrapolation is dangerous [illegible] limited to about five decades [illegible]

The counts of population for the different points in the curve are—

Decennial Period.		Calculated Population in millions.	Census.
1871	..	209,870,000	206,162,360
1881	..	250,000,000	253,896,330
1891	..	279,920,000	287,314,671
1901	..	300,000,000	294,361,056
1911	..	312,530,000	315,156,396
1921	..	320,000,000	318,942,480
1931	..	324,330,000	..
1941	..	326,810,000	..
1951	..	328,210,000	..
1961	..	329,000,000	..
1971	..	329,440,000	..

The upper asymptote is 330 millions.

Apparently the population of India is very near its saturation point, and, for all practical purposes, it may be taken as proved that India as a whole is already over-populated.

Bombay Presidency.

History of its growth.—A rough estimate of the population of the Bombay Presidency was made in 1854, but the first census with any pretensions to accuracy was that taken in 1872, when the population was found to be 23,099,332. The following notable events occurred between 1872 and 1921 :—

(1) The famine of 1876 to 1878 was widespread and severe.

(2) Plague broke out and spread all over the Presidency in 1896 to 1901. During the first decade of the present century, plague continued to be very prevalent causing a registered mortality of 1·4 millions in that period.

(3) In 1897, the Deccan was badly affected by famine.

(4) Another severe famine occurred in the Deccan in 1900, and a continuation of plague prevented recovery from these two famines.

(5) During the period 1901 to 1910 ; crops were very poor in Gujrat in 1901 and 1904 ; in the Deccan and Karnatak in 1905 ; and in most of the provinces in 1907.

(6) During 1918-19, influenza wrought tremendous havoc.

Since 1821 and 1822, estimates of population have been made on several occasions through the agency of the revenue staff, but these are too unreliable to be worth quoting The first regular census was taken in 1871, and the figures for this and the succeeding counts are as follows —

1871 . .	31,597,872
1881	31,170,631
1891	36,064,408
1901	38,653,558
1911	41,870,160
1921	42,791 155

The equation of the best-fitting growth curve for these figures is—

$$y = \frac{120\ 07056}{2\ 75220 + e^{-0\ 0\ 5905\ x}}$$

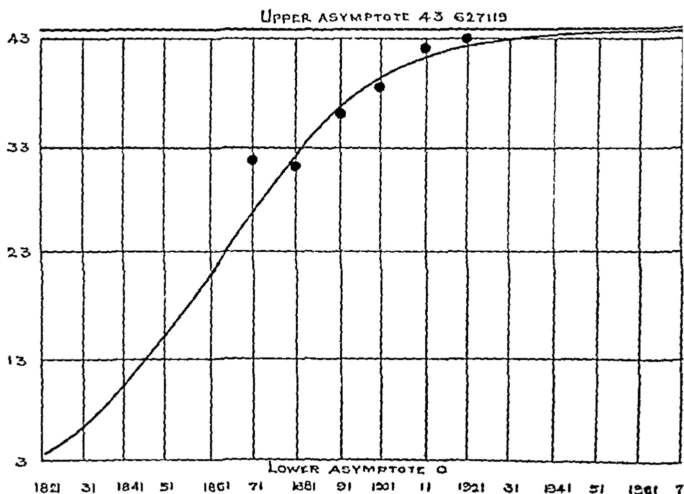


Fig 4 Population Growth Curve of the Madras Presidency.

taken as approximately reliable. Those for the years after 1941, and before 1851, cannot, however, be relied upon.

The figures obtained by extrapolation are—

Year.		Calculated Population in millions.	Census in millions.
1851	..	18·0611	..
1861	..	20·4586	..
1871	..	22·4459	23·0993
1881	..	24·0000	23·4324
1891	..	25·1613	26·9604
1901	..	26·0015	25·4682
1911	..	26·5909	27·0843
1921	..	27·0000	26·7576
1931	..	27·2798	..
1941	..	27·4695	..
1951	..	27·5975	..
1961	..	27·6834	..
1971	..	27·7411	..

The upper asymptote is 27·8570 millions.

The population of 1921 is thus seen to be within a million of its asymptotic population. This would suggest that if the population is to be adequately fed, agricultural methods must be improved and that early legislation limiting export of food is desirable, even although plague, famine and influenza have so far kept the population below its maximum limit. The curve proves that Bombay Presidency is already overcrowded, and a serious situation is bound to arise within the next few decades unless present conditions undergo a marked change.

MADRAS PRESIDENCY.

History of its growth.—The area of this Presidency is 152,875 square miles, or about 30,000 square miles more than the United Kingdom. Its greatest length from north-east to south-west is approximately 950 miles, and its maximum width about 450 miles.

In order to test the application of the growth curve to urban populations, the cities of Bombay and Madras were selected and, in addition, Madura has also been considered because that city presents all the features of a rapidly growing urban centre

BOMBAY CITY

History of its growth —The capital of the Presidency of Bombay, and the principal sea port of western India is situated on one of the islands lying in a group off the Konkan coast By the construction of causeways and breakwaters, it is now permanently united to the north with the larger island of Salsette and with the mainland The island consists of a low lying plain about 11½ miles long and 3 to 4 broad, flanked by two parallel ridges of low hills

When Bombay was ceded to the British in 1698 the population according to Dr John Fryer(28) was about 10,000 Subsequent estimates of its population are given in the following list —

Year	Authority	Population
1698		10 000
1744	Niebuhr	70 000
1780	Special Committee	113 7[illegible]6
1814	Contemporary Writer	180 000
1836	Recorded Estimate	236 000
1846		566 119
1864	Census by Sir Bartle Frere	816 562

The abnormal increase between 1846 and 1864 is said to have been largely due to the extraordinary prosperity which Bombay enjoyed during the American War, and the population had fallen considerably before the first Indian census was taken The six figures are—

1872	census	644,405
1881	,,	773,196
1891	,,	821,764
1901	,,	776 006
1911	,	979,445
1921	,,	1,175,914

The population figures obtained from the curve are—

Year.		Calculated Population in millions.	Census in millions.
1851	..	14·80	..
1861	..	20·65	..
1871	..	26·67	31·60
1881	..	32·00	31·17
1891	..	36·13	36·06
1901	..	39·01	38·65
1911	..	40·86	41·87
1921	..	42·00	42·79
1931	..	42·68	..
1941	..	43·08	..
1951	..	43·31	..
1961	..	43·45	..
1971	..	43·53	..

The upper asymptote is 43·63 millions.

Extrapolation for the years prior to the origin year, 1881, cannot be considered as reliable. The asymptotic population indicates that Madras Presidency is very close to its saturation point, and that in about 20 years it will be over-populated, should existing conditions continue.

Indian Cities.

The 1921 population counts of the chief cities of India having a population of over 300,000 are—

City.		Population.
1. Greater Calcutta	..	1,327,547
2. Bombay	..	1,175,914
3. Madras	..	526,911
4. Hyderabad (Deccan)		404,185
5. Rangoon	..	341,962
6. Delhi	..	304,420

giving an upper asymptote of 1 2 millions The population figures for the census years and extrapolated counts for 1801 to 1836 and 1921 to 2001 are given below

Year	Calculated Population	Census
1801	61 392	
1811	90 853	
1821	132 8[illegible]0	
1831	190 858	
1841	267 943	
1851	364 090	
1861	479 302	
1871	603 822	
1872	616 52[illegible]	[illegible]
1881	728 402	[illegible]
1891	842 937	[illegible]
1901	940 198	[illegible]
1906	981 3[illegible]2	[illegible]
1911	1 017 464	[illegible]
1921	1 075 69[illegible]	[illegible]
1931	1 1[illegible]	
1941	1 1[illegible]	
1951	[illegible]	--
1961	[illegible]	--
1971	[illegible]	--
1981	[illegible]	
1991	[illegible]	
2001	[illegible]	

Upper asymptote = [illegible] millions

The point of inflexion of [illegible]
all India census was taken [illegible]

The large decrease in 1901 is explained by the fact that, between 1896 to 1901, plague caused no less than 114,000 deaths. Moreover, when the census of 1901 was being taken a virulent epidemic was in progress, and large numbers of the permanent residents had sought safety in flight. A fresh enumeration, taken in 1906 by the City health department, gave a population of 977,822. The census of 1911, it is said, was taken during the 'Holi' holidays, when many of the emigrants from the neighbouring districts had left the City for their permanent homes. Many of the mills were also temporarily closed at the time owing to the prohibitive price of raw cotton.

Apart from these factors, some slackening in the rate of growth is to be expected. Like other large trading and industrial centres, Bombay is peopled mainly by immigrants; more than 80 per cent of its inhabitants having been born elsewhere.

The tremendous increase between 1911 and 1921, in spite of the influenza epidemic, is easily explained. During the great war, Bombay City prospered exceedingly, and the post-war trade boom was in the latter year still in existence.

Selecting the population counts of 1836, 1872 and 1906 as the most acceptable from the point of view of reliability, the first equation obtained was—

$$y = \frac{3{\cdot}00719}{0{\cdot}25303 + e^{-0{\cdot}01175x}}.$$

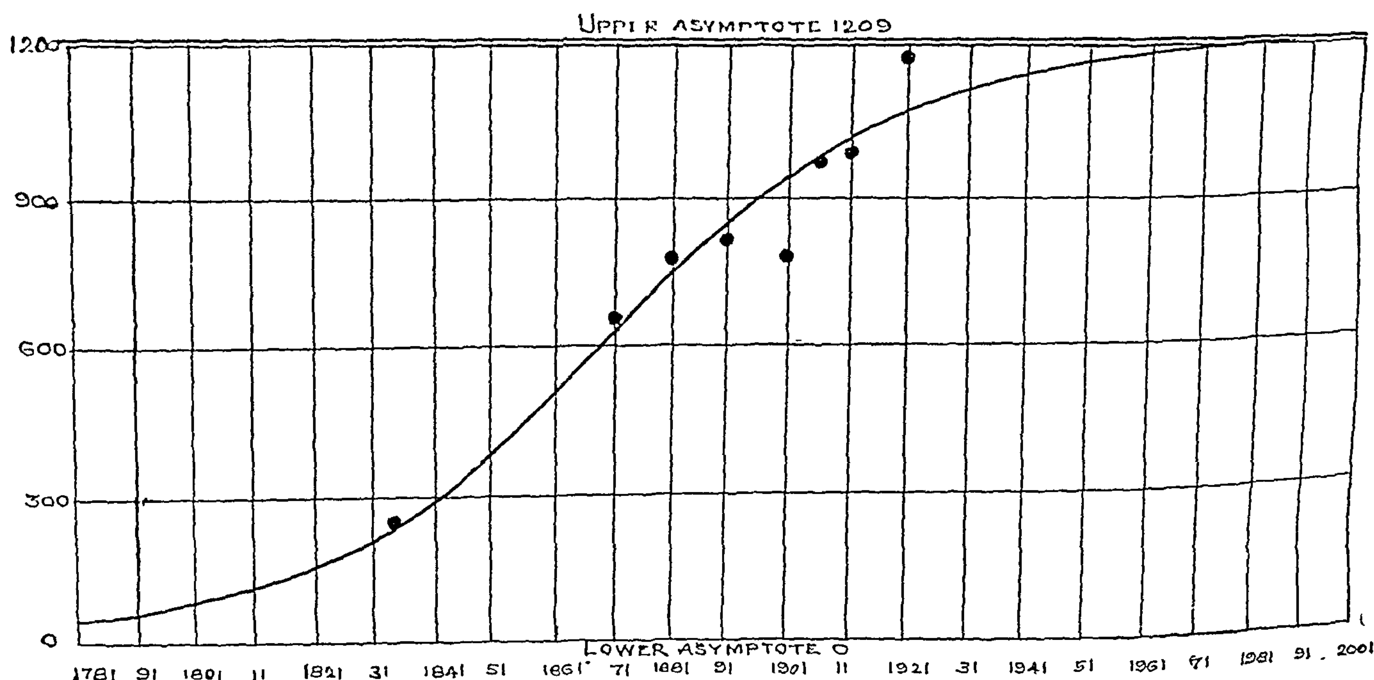


Fig. 5. Population Growth Curve of Bombay City.

After corrections were applied to the constants, the equation became—

$$y = \frac{2{\cdot}79294}{0{\cdot}230989 + e^{-0{\cdot}0417\ x}}$$

The calculated figures are—

Year.		Calculated Population in hundred thousands.	Census in hundred thousands.
1851	..	2·88	..
1861	..	3·35	..
1871	..	3·80003	3·97
1881	..	4·22210	4·06
1891	..	4·60015	4·53
1901	..	4·92647	5·09
1911	..	5·19931	5·19
1921	..	5·42152	5·27
1931	..	5·59849	..
1941	..	5·73710	..
1951	..	5·84	..
1961	..	5·93	..
1971	..	5·99	..

The upper asymptote is 617,143.

These figures indicate that Madras is nearing its saturation point, and that under present conditions it will approach its upper limit in about 30 to 40 years. For all practical purposes the city must be deemed to be overcrowded, although not to such a degree as Bombay. Room for growth remains, but unless steps are

These figures show that the population grew fairly rapidly during the period 1881 to 1901, but since then has remained almost stationary Molony accounts for the later small natural increases by a heavy infantile mortality Another factor is that, 'Since 1901, several private factories have been closed, as also the Government Gun Carriage Factory which formerly employed several thousand hands'(29) The very small increase between 1911 and 1921 can be accounted for by the toll of life exacted by the influenza epidemic during 1918 and 1919 The industrial boom of 1918 to 1921, which made the Bombay population increase by leaps and bounds, had no influence on the numbers in Madras City

The equation of the curve fitted to the census figures is –

$$y = \frac{98\ 89316}{1\ 60244 + e^{0\ 030139x}}$$

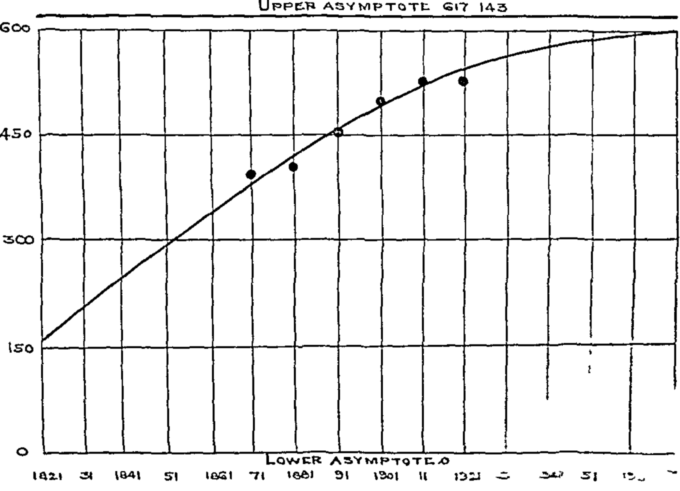


Fig. 6. Population Growth Curve of Madras City

under consideration, but the opinion of Molony, a keen student of the subject, may effectively be quoted 'If man does not live by bread alone, neither does he live without it and in the last resort the population of a tract, at least in Madras is mainly determined by the amount of food that its soil can and does produce Here as yet the development of industry and urban life is, and perhaps will for ever be, too small to demand consideration of a population which buys its food rather than produces it '(29)

The exigencies of space preclude any but the most general reference to the many aspects of the population problem So far as the Presidencies are concerned, their climate, their rainfall, their rivers and their irrigation schemes, their varying density of population, their history and the customs and habits of their people are all of importance This paper does not attempt to deal with any of these, as the inter relation between population and subsistence level cannot be determined satisfactorily until more reliable statistics are available for the numerous factors which affect that relationship

THE INTERRELATION OF POPULATION WITH PUBLIC HEALTH ACTIVITIES

Public health problems are intimately bound up with the question of population, and the latter must be taken into consideration in any evaluation of public health measures So long as public health departments confine their attention merely to eradication of disease so long will their efforts end in disappointment, because the law propounded by Malthus is inexorable If mankind continues unheedingly to fill the earth with people, Nature will interfere and eliminate the excess in spite of the best laid plans of preventive medicine

It is, therefore, contended that the present position of public health expenditure in this and other countries deserves critical examination Public money is spent largely on the criminal, the pauper and the indolent, free hospitals and alms houses exist by the dozen, schools for feeble minded and backward children are ev[illegible] where being multiplied Public health organizations become more and [illegible] involved in every sphere of human life, and perhaps as a result, death ra[illegible] are gradually declining From the viewpoint of the student of population, [illegible] ver this downward trend in death rate gives little cause for congratulation, un[illegible] it can be shown that conditions of living concomitantly improve to such an [illegible] as to make life reasonably happy A peaceful death is sometimes more [illegible] desired than a prolonged life of disease and poverty The economic battle [illegible] takes an indirect but tremendous toll of human life so that a period of declin[illegible] death rates must be followed by a period of increased mortality, unless by [illegible] means the population is kept below saturation point

One is therefore compelled to ask why so much public mon[illegible] should be spe[illegible] on the good for nothing 'Why are there not schools for prec[illegible]ous and br[illegible] children? Why do the ambitious and industrious have to f[illegible] [illegible] cation and for health? Why are the rotten timbers of [illegible] painted, while the more solid framework is abandoned to [illegible]

taken to cope with the growing population by inducing spread to the suburbs, the evils of overcrowding will be experienced in the near future

Madura City.

This town lies about 350 miles from the capital of the Presidency, and, situated as it is in the centre of a group of prosperous districts, it has steadily grown, until it now is the second largest city in the Presidency. The census counts of population of the city from 1871 to 1921, corrected for increases in its area, are—

1871	..	..	..	..	52,231
1881	..	..	..	..	71,389
1891	..	..	..	.	88,136
1901	..	..	..	.	106,832
1911	..	..	..	.	135,115
1921	..	..	..	..	138,891

The diminished increase in the 1911 to 1921 decade is due to the havoc caused by the influenza epidemic of 1918 and 1919 Otherwise the growth has been very steady.

The equation of the growth curve fitted to these figures is—

$$y = \frac{123\ 79639}{0\ 719116 + e^{0\ 04-0715x}}.$$

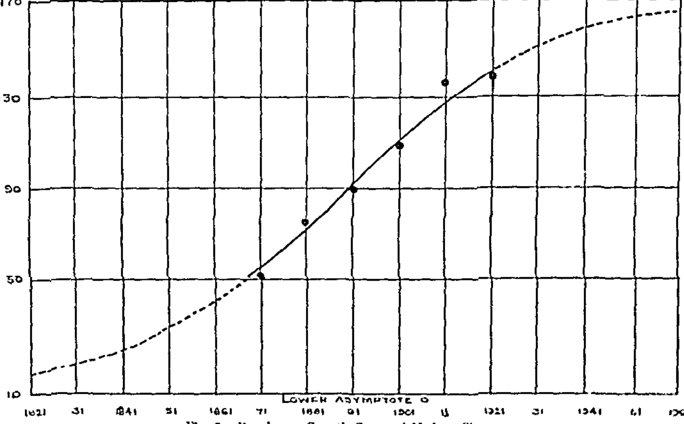


Fig. 7 Population Growth Curve of Madura City.

is often incapable of bearing any, and is generally exhausted by two or three But poverty, though it does not prevent the generation, is extremely unfavourable to the rearing of children It is not uncommon, I have been frequently told, for a mother who had borne twenty children not to have two alive '

These are the facts of the case and in our opinion, only two ways exist by which it is possible to meet the situation One is to restrict the birth rate, the other to improve conditions of life by increasing the productivity of the soil and of labour As complete figures for even the most important crops of India do not exist, it is not possible to speak with any degree of certainty on this subject The issue is, however, not only that population is outrunning the means of subsistence but that the silent pressure of excessive numbers is now evidenced by increasing un employment, rising prices and further encroachments on the standards of life, especially in the agricultural community The criticism may be made that no account has been taken of the possibility that science may show the way by which means of subsistence can be largely increased The yield per acre of land now under cultivation might of course, be improved, and poorer land now lying uncultivated might with effort produce additional food We would suggest, however, that these possibilities do not detract from the seriousness of the situation The law of diminishing returns in respect of cultivated land must be remembered Some authorities have already forecast that within 100 years the world population at its present rate of increase will have overtaken the means of subsistence, whatever science may be able to do Although, therefore, cause for immediate alarm may not exist, it seems imperative to prepare for this emergency, as it is well known that the present food exporting countries of the world are themselves rapidly approaching saturation point in respect of population, and long before that stage is reached, further exports of food stuffs will have ceased Nothing that has happened since 1798 has, in any case, disproved ' the relentless insistence of Malthus' logic ' Whatever the future may produce in the way of scientific agricultural improvements, it is certain that an upper limit to the population of a given area must sooner or later be reached The growth curves given in this paper prove that the upper limit in India will be reached sooner rather than later

CONCLUSION

It is not the purpose of this paper to make dogmatic statements on the population question, or even to advocate the adoption of any particular course of action On the other hand, all that is possible is to indicate the nature of the problem, to emphasize the trend of events, and to draw attention to some of the factors which must be taken into account if the subject is to be viewed from the proper angle

The people of India are, to a large degree, ignorant of the purpose of public health measures They are indeed, not only suspicious of new ideas, but resent interference with established habit and custom The Public Health Officer must, therefore, not only be up to date in the principles of preventive medicine, but must

Spencer emphatically protested against the extreme cruelty of ' fostering the good-for-nothing at the expense of the good. ' ' It is a deliberate storing up of miseries for future generations. There is no greater curse to posterity than that of bequeathing to them an increasing population of imbeciles.' It is not suggested that this type of social sanitation is undesirable or unnecessary, or that any civilized nation can afford to neglect it, but it is doubtful if its results are sufficiently appreciated by enthusiastic reformers and it is certain that they are not commensurate with its cost. The world of to-day has been compelled to adopt an entirely new concept of life, but few have cared to visualize the consequences. Bacteriology, parasitology, prophylaxis and immunology have developed amazingly during the past three decades, and the most serious scourges of humanity have been, or are being, conquered. These and other processes for the amelioration of human misery and suffering will inevitably result in vast increases in world population, and this background of rapidly increasing numbers must profoundly influence the whole stage of human life in the very near future.

The evils of India are ably summed up as follows by Wattal. Compared with European countries India has, he says—

' (*a*) A smaller natural increase in spite of a high birth rate ;
(*b*) A smaller fecundity in spite of a larger percentage of married persons ;
(*c*) An infantile mortality twice or thrice or even four times as high ;
(*d*) A much smaller average expectation of life with a steady downward tendency ;
(*e*) A high death rate among young mothers ; and, lastly,
(*f*) In common with European countries the tendency to increase is greater among the lower classes than among the higher. '(10)

None of these evils are new ; they have all been met with in other countries. Disease has always worked its greatest havoc in the lowest grades of society. The highest birth rates and highest death rates have always been recorded in the same groups. The great mass of the people of India are poor, and some of the social customs only enhance the high mortality among infants and young mothers. Numerous children born in rapid succession, to parents already suffering from malnutrition, cannot hope to survive and the vicious circle of poverty, disease and death unceasingly whirls its thousands into an early grave. It is indeed impossible to exaggerate the tale of ill-health, of toil and drudgery, of shrunken bodies and blighted souls, of children before they are born sentenced to early death, or, perhaps worse, to a life without hope.

Whether poverty is in itself a cause of high infant mortality, or is merely a symptom of deeper lying causes, is a question which need not now concern us. The poverty-stricken are, however, notoriously careless as to the future, and the observations of Adam Smith apply particularly to the people of India at the present day. ' Poverty ,' he said, ' seems even to be favourable to generation. A half-starved woman frequently bears more than twenty children, while a pampered fine lady

rates yet they have introduced to the women of the poorer classes an element of hope which they had never before experienced

It is well known, however that both maternal and infant mortality rates increase under adverse economic conditions, and the mere multiplication of welfare centres will prove of little avail, unless the general public realizes that a high death rate is the normal corollary to a high birth rate and that over population is inevitable if man places no restriction on his natural fecundity

'Food production may reach the heights of efficiency and its distribution be wellnigh perfect but if there is no end to the number of mouths to fill except as they are kept in check by positive agents of repression we shall be in the same plight as were the daughters of Danaus for ever carrying water in a sieve (2)

The continuation of such circumstances will inevitably bring in their train wars famine and disease and it is no reply to say that war famine and disease have always afflicted mankind If India is to save her 300 to 400 millions of people from being permanently chained to poverty and distress the question of population growth deserves the considered attention not only of statisticians and sociological theorists, but of all who are interested in the social economic and political welfare of the country

'As emigration on an extensive scale is out of the question, the alternatives for the future are either a reduction in the birth rate as a result of the spread of education and a gradual change of social customs or such a change in the conditions of life as will permit of a steady increase in the means of subsistence or finally a continuance in future of such periods of famine with their accompanying destruction of population as have marked the past history of India '(31)

The suggestion may be made that in order to meet these conditions further and 'enforceable' legislation is required The problems connected with health and population, however, will never be solved by legislative enactment and strict adherence to religious laws would have a far greater effect The average Indian is firmly bound by religious tenets, and spiritual development depends more than is usually thought on improvement in social conditions, whilst the religious sense is bound to deteriorate, if not atrophy, in sordid surroundings

We reiterate the opinion that in India the facts of population growth and of social and agricultural economics point inevitably to the fulfilment of the Malthusian prediction In this country, as in others, 'man stands to day at the parting of the ways, with the choice of controlling his own destiny or of being tossed about until the end of time by the blind forces of the environment in which he finds himself '(2)

REFERENCES

(1) PEARL, RAYMOND — Human Biology

(2) EAST — Mankind at the Cross roads

(3) PEARL RAYMOND and REED LOWELL J (1920) — On the Rate of Growth of the Population of the United States since 1790 and its Mathematical Representation *Proc Nat Acad Sci*, Vol. 6, June

be a man possessing a broad outlook on life, and a wide knowledge of the medical and social sciences. In arranging the stage of his activities he must be able to 'assign to each of the important actors a suitable part' and 'by his tact and diplomacy prevent friction, misunderstanding, jealousies and indifferences on the part of those who should play leading rôles.(33) He must be capable of interpreting to the community the cost of unfavourable economic conditions, premature deaths, preventable sickness and their resultant social tragedies. No permanent good can arise from the distribution of academic homilies and commonplaces on the value of sanitary habits, proper housing, or an adequate dietary unless, at the same time, due stress is laid on the social and economic factors that make for health and increased powers of resistance. 'The interdependence between an effective control of communicable diseases and economic conditions is so intimate, that we ought to study the latter more thoroughly and dispassionately, and seek to drive this fact home upon legislators, civic groups and others with all the force at our command.'(33)

It is not suggested that health propaganda work is valueless. The publicity campaign in regard to matters of health has, without doubt, had a profound effect in forming public opinion during recent years. The teaching of elementary hygiene in elementary and secondary schools must also be of the greatest advantage to the rising generations. To assume, however, that health leaflets convey a thrill of delight to readers whose diet probably does not satisfy their normal appetite, or that a health lesson is all that is required for children suffering from chronic malnutrition and disease, is to live in a world of vain imagination.

Education, in fact, is far less effective as an agent for the promotion of health than is an adequate family budget. The great war exposed only too clearly the devastating effects of poverty on community health. 'Germany, with all its knowledge and machinery for the prevention of diseases, was plunged into starvation through economic bankruptcy, and tuberculosis ravaged its population, in defiance of all that mere science and learning in preventive medicine could do. What happened to that nation, which only a decade ago was in the van of progress is most forceful proof of the public health value of an adequate wage.'(33)

The social and economic factors that determine the health of a nation far transcend in importance the conventional and routine duties of a visionless health officer, and India requires leaders of both sexes who will effect a happy union between sanitary and social science.

The provincial health departments of India have within recent years shouldered new burdens of responsibility in connection with the health of the people. These new activities are intimately connected with the social and economic aspects of the country, especially where they deal with the health and well-being of the newborn infant and the young mother. Child-welfare and maternity-relief centres are now to be met with in many parts of the country, and although, so far, they may not have been very successful in reducing infantile and maternal mortality

Col Russell was evidently a follower of Malthus whose doctrine was no longer accepted in its entirety since it has failed to take into account many vital factors such as the constant augmentation of the food supply as the result of modern scientific developments On this account he deprecated the view that the 'saturation point' of any given population should be regarded as a fixed point and he thought that any influence based upon this view should be accepted with reserve He furthermore held that an increase of population, far from necessarily being an evil, might stimulate individuals and nations to increased efficiency, and that, as in England, the 'struggle for existence' would lead automatically, as the result of later marriages birth control and emigration, to an adjustment between the number of the population and the available food supply at all times The questions underlying these problems were however, too large and too fundamental to be adequately discussed with the time at his disposal They were nevertheless of extraordinary interest and importance not only to sanitarians, but also to administrators and statesmen He felt however bound to say that Col Russell had not brought forward any prima facie evidence that militated against the view that it was the duty of public health officials to promote the public health by every means in their power

Lieut Col F Bisset I M S (Burma) Said he had been engaged in Public Health work for many years and he felt it necessary to oppose the view which might be read into Col Russell's paper that epidemic disease should be allowed to go on helping to keep the population down Mankind was still in process of evolution He had had to fight the forces of nature in the process Since the numbers had increased greatly on the surface of the earth, his chief enemies had become parasitic diseases He must fight them or go under Man was a thinking animal He had acquired a great deal of knowledge He was constantly acquiring more He already had a large measure of control over his own fate He might be able in future to do a great deal more than at present towards preventing over population The only practicable method of controlling increase of population at present was artificial limitation of families, but the future might show us other and undreamt of ways If it ever became necessary for man to limit his numbers for economic reasons he would have to devise a method which would be under his control He had no control of the infectious diseases except that he could suffer them He did not think the question of over population should be looked at from a local point of view The world as a whole was not over populated and it did not matter if circumscribed over populated areas had to get their food supply from outside When public health measures were introduced into the United Kingdom as every one knows, there were not wanting those who prophesied disaster In spite of the success of the measures there was still no sign of the prophecies of evil being fulfilled It is true there is much unemployment in the United Kingdom but he believed that was due to bad legislation and wrong action by trade unions and employers

Lieut Col A J H Russell, I M S (Madras) replied The discussion has entirely justified my presentation of the paper and I do not think that the reading of it is incompatible with the holding of my present appointment

As regards saturation point, it is fixed only under present conditions but as I said I cannot foresee any possible great change in conditions in India

(4) PEARL, RAYMOND (1921) .. Vitality of the Peoples of America. *Amer. Jour. Hyg.*, Vol. 1, No. 546, September to November.
(5) PEARL, RAYMOND (1924) .. The Curve of Population Growth. *Proc. Amer. Phil. Soc.*, Vol. LXIII, No. 1.
(6) PEARL, RAYMOND (1923) .. Some Eugenic Aspects of the Problem of Population. Reprinted from Eugenics in Race and State, Vol. II.
(7) CARR-SAUNDERS (1925) .. .. Population, Oxford University Press.
(8) POVERTY, NUTRITION AND GROWTH, *Medical Research Council Special Report Series*, No. 101.
(9) LANCHESTER, H. V. .. .. Report on Madras Town.
(10) WATTAL, P. K. .. .. The Population Problem in India.
(11) NAOROJI, DADABHAI .. .. Poverty.
(12) MEMORANDUM ON THE RESULTS OF FIFTY YEARS OF BRITISH RULE IN INDIA, 1909 (OFFICIAL PUBLICATIONS).
(13) STATISTICS OF BRITISH INDIA, PARTS I TO IV.
(14) STATISTICAL ABSTRACT RELATING TO BRITISH INDIA (ANNUAL).
(15) AGRICULTURAL STATISTICS OF INDIA.
(16) CHATTERTON, A. .. .. Agricultural and Industrial Problems of India.
(17) REPORT OF THE ROYAL COMMISSION ON FAMINES IN INDIA, 1901.
(18) BARKER, D. A. (1913) .. .. Famine Relief in India. Article in the *Economic Review*, July.
(19) MUZUMDAR, N. M. .. .. The Study of Indian Economics.
(20) BOWLEY, A. L. (1915) .. .. Measurement of Social Phenomena.
(21) DUBLIN .. .. .. Population Problems.
(22) MAYO-SMITH .. .. Statistics and Sociology.
(23) WRIGHT, HAROLD .. .. Population.
(24) GRIFFITH .. .. .. Population Problems of the Age of Malthus.
(25) FLORENCE, P. SARGANT (1926) .. Over-population (Theory and Statistics).
(26) NARAIN, BRIJ .. .. Indian Economic Problems.
(27) YULE, UDNY .. .. The Fall of the Birth Rate.
(28) *Imperial Gazetteer of India.*
(29) THE MADRAS CENSUS REPORT, 1911.
(30) THE CENSUS REPORT FOR INDIA, 1911.
(31) HARDY, G. F. (1901) .. .. Memorandum on the Age Tables and Rates of Mortality of the Indian Census of 1901.
(32) A STATISTICAL ATLAS OF THE MADRAS PRESIDENCY, 1908.
(33) HARRIS, LOUIS I. (1925) .. 'Values in the Control of Communicable Disease,' *Amer. Jour. Pub. Health*, April.
(34) THE CENSUS REPORTS FOR THE DIFFERENT PROVINCES OF INDIA.
(35) THE BOMBAY CENSUS REPORT, 1921.
(36) INDIA IN 1922–23.
(37) PUBLICATIONS OF THE BOMBAY LABOUR OFFICE.
(38) KNIBBS (1917) .. .. Census of the Commonwealth of Australia.
(39) MARSHALL, DR. .. .. Principles of Economics.
(40) NARAIN, BRIJ .. .. Population of India.

DISCUSSION.

Lieut.-Col. C. A. Gill, I.M.S. (Punjab): Thanked Col. Russell for his interesting paper which showed the importance of attempting to evaluate public health problems by mathematical methods. He pointed out, however, that the implications attaching to the thesis advanced by Col. Russell placed the latter, as Director of Public Health of Madras, in the illogical position of strenuously performing a duty which he regarded as opposed to the public interest.

A HEALTH CAMPAIGN AMONG 7,000 TEA GARDEN COOLIES

BY

J NEIL LEITCH, M B B S M R C S L R C P
Medical Officer Assam Company Limited

It has long been a salutary custom to employ military terms when speaking of medical or sanitary endeavour, for the reality of the enemy, the variety of his weapons, and the intensity of the warfare soon become evident to anyone entering the lists and trying to do something in forwarding the cause of health A well conceived plan of campaign demands a broad outlook derived from a preliminary survey of the whole field a true appraisal of every factor an ample equipment a complete cohesion, and then a simultaneous advance along the whole battle front, with all the animation of conscious superiority to the foe Unfortunately, the struggle is too often alone, battling against overwhelming odds and weak through isolation

The medical officer of a group of tea gardens has all too often to spend the greater part of his time wearing out any make of car as quickly as possible on atrocious roads During his short stay at various hospitals he is too tired to do the good work he might otherwise attempt, and the large area he has to cover gives him no opportunity for coping with the problem as he might wish This unsatisfactory state is being realized by the planting community and is gradually being met by improved roads, smaller medical districts, and better medical equipment

This record concerns work carried on during the past three years on three tea estates in Assam My staff consists of one well trained Calcutta graduate, one other native doctor, and eight compounders During the rainy months of the year, little can be done besides ordinary maintenance work It is only in the cold weather that the staff can be concentrated on one spot and fresh work undertaken In accordance with the gradually growing ideas of preventive medicine, I have been trying to reduce sickness rather than cure disease and in this outline of the work I propose three sections

I

The initial difficulties were threefold Firstly, the hospital records had not been kept on any system, so that no useful information could be obtained from them Statistics were incomplete and misleading Secondly, different methods

In connection with possible new supplies of food, I have already stated that there are now few additional areas of food-producing land left unexploited and it is no argument to say that irrigation schemes are producing more supplies. That can only postpone for a time the evil day.

Col. Bisset stated that the million unemployed was to him no evidence that the population of Britain was near saturation point. If it does not mean this, may I ask what it can possibly mean ? I suggest that those who have listened to the paper should read up the subject and postpone coming to a decision until they do so. I do not think that it is a health officer's duty to leave the future to itself. As I have said, the reading of this paper before the F. E. A. T. M. Congress has been justified, and I trust that those who have listened to it, will not entirely put aside its implications.

TABLE I

Showing the results obtained from 3,875 consecutive examinations

Age in Years	Total Examined	Percentage Married	Percentage Unmarried	Number of Children per 100 Women		Percentage born in Assam	Average Years in Assam	Height (ft and in)	Weight (st and lbs)	Chest		Girth	Blood Pressure (M M of Hg)		Hæmoglobin per cent	Good Teeth per cent	Normal Liver per cent	Normal Spleen per cent.
Males				Alive	Dead					Insp	Exsp		Syst	Diast				
0–5 .	322	0	100	—	—	31	3	2—3	1—2 3	20	19	18			80	100	100	93
6–10	207	0	100	—	—	18	8	3—4 2″	2 6—3 8	23	22	21	80 90	40—50	85	99	100	87
11–15	135	1	99	—	—	4	11	4′—5′	3 10 4 10	27	25	24	90 100	60—70	85	97	99	88
16–20 .	148	42	58	—	—	0 5	13	4 10″ 5 3″	5 7	32	29	20				94	100	90
21–25 .	155	54	46	—	—	4	11	5 5 4″	6 8—7 8	33	31	[illegible]				92	100	90
26–30 ..	269	88	12	—	—	0	14	5 5 5″	6 9—8 0							88	100	90
31–35 .	220	90	10	—	—	0										82	99	89
36–40 ..	223	90	10	—	—	0							95—110	65—75		80	100	90
41–45 .	119	88	12	—	—	0						28				67	100	94
46—up .	202	86	14	—	—	0							100 120	70 80		59	99	92

Total Males .. 2,000

prevailed on different gardens involving all dealings with disease and sanitation. This led to confusion and there was no basis on which results could be compared. Thirdly, there was no standard of comparison such as normal weight, height and general physical measurements, as European tables are not applicable to such a population.

An attempt was made to overcome these difficulties. The sick registers were revised so as to show the daily attendance of each patient throughout a calendar month.

A monthly health return form, which was originally compiled by Dr. Hermitte of Moabund, was adopted with his permission, and the nomenclature of diseases therein was insisted on throughout the hospital records. These returns, coming in monthly from each garden, have been a tremendous help in controlling disease (Chart I).

A medical history sheet was elaborated to record all points of importance in logical order, and eliminate the personal element as far as possible. The use of these will be explained in a moment. A specimen is given in Chart II. Ascheme of standard treatments was drawn up, the principles of which were insisted on, so as to compare the results obtained.

A specimen of this is given in the Appendix. Lastly, printed rules and regulations were distributed to all the staff, defining the duties of each, eliminating overlapping and fixing responsibility.

The next step we took was to medically examine each of the 7,000 men, women and children which composed our population. For this purpose, 100 to 200 were paraded daily and results were recorded on the medical history sheets. These were intended to be a permanent record of the health of all our staff. At this preliminary examination the data on the top half of the first page, as well as the condition of liver, spleen, teeth, blood pressure, and hæmoglobin percentage were recorded; also any obvious disease. From time to time subsequently, when the patient reported sick, fresh clinical observations were made and recorded in the appropriate space with the date of each entry. Under the 'Course and Treatment' column a summary of each illness was recorded. In the ordinary course it is estimated that sufficient space exists on one case sheet for a good number of years, and when a continuation sheet is needed, a second sheet is folded in with the first. In practice it was found that unless logical grouping of observations was insisted on, important points were missed, thus spoiling the utility of the sheets for subsequent research.

The sheets were filed in two ways. First alphabetically, each group of lines in separate drawers, on the card index system; the record of any coolie can be turned up within a minute for reference. Secondly, records of clinical groups of diseases were transcribed into special books of sheets made for the purpose of such research.

At the time of this examination, everyone not recently vaccinated had this done, and everyone received a dose of hookworm medicine. The records were then examined and lists made of all abnormals.

Table I gives the data we obtained from 4 000 consecutive examinations As accurate age is difficult to ascertain I have classified the results in age groups of five years, and in most cases given a maximum and minimum finding for these ages There are many points of interest in this table Twenty five per cent of the girls are married under 15 years of age and while 95 per cent of the girls are married under 25 years only 54 per cent of the men are married by then An average of 12 per cent of the men never marry, although the number of men and women on these gardens is about equal The history given by mothers of the number of children alive and dead is remarkable in comparison with death returns during the last ten years For 972 children alive, we have 931 dead, a ghastly legacy of ignorance or indifference These figures must be interpreted in the light of the following columns showing length of residence in Assam Height, weight, chest and girth measurements are all conspicuously below western standards, and although this may partly be due to racial differences it is mostly due to adverse economic conditions and a poor state of health Blood pressure is consistently lower than in Europe The hæmoglobin percentage may be considered satisfactory, and is distinctly higher than three years ago The condition of the teeth gradually deteriorates with age, but probably rather less so than among Europeans Liver enlargement is rare and when present in this district, usually indicates kala azar A spleen index of under ten per cent is due to vigorous anti malarial measures for a prolonged time

TABLE II

Recording the results of the medical examination of 7,000 coolies

TOTAL NUMBER EXAMINED	7,000	
Abnormals	Number	Per cent
Enlarged spleen	577	8 2
Hb per cent 70 or under	1 105	15 8
Bad teeth	393	5 6
Kala azar	10	0 14
Leprosy	18	0 25
Syphilis	112	1 6
Deformities	37	0 53

Table II shows a list of the abnormals found While the existence of many was already known, the careful examination revealed many more leprosy and syphilis cases, besides a few of kala azar All these cases were submitted to

TABLE I—*concld.*

Age in Years.	Total Examined.	Percentage Married.	Percentage Unmarried.	Number of Children per 100 Women.		Percentage born in Assam	Average Years in Assam.	Height (ft. and in.)	Weight (st. and lbs.)	Chest.		Girth.	Blood Pressure (M.M. of Hg.)		Hæmoglobin per cent.	Good Teeth per cent.	Normal Liver per cent.	Normal Spleen per cent.
Females.				Alive.	Dead.					Insp.	Exsp.		Syst.	Diast.				
0 – 5 ..	228	0	100	0	0	33	3	2′ – 3′	1—2·3	19	18	17	..	..	80	100	100	92
6—10 ..	185	1	90	0	0	14	7	3′—4′ 2″	2·4—3·4	24	23	21	80	50	..	99	..	89
11—15 ..	163	25	75	1·2	0	4·3	11	4′—4′ 10″	4 – 5	26	25	23	80—90	50—60	..	97	..	88
16—20 ..	207	78	22	38	28	0.5	14	4′ 6″—5′	5—7	29	28	26	90—100	60—70	..	94	..	90
21—25 ..	190	95	5	80	66	3	11	4′ 7″ – 5′ 2″	6·6—7·7	30	29	26	..	..	..	92	..	94
26—30 ..	291	97	3	98	76	0	14	..	..	..	..	..	..	..	..	75	..	98
31—35 ..	201	100	0	170	115	1	..	..	..	..	..	..	..	60—80	..	65	..	..
36—40 ..	197	97	3	200	179	0	..	..	..	..	..	..	..	..	..	60	..	..
41—45 ..	79	100	0	180	207	0	..	..	..	..	..	..	..	..	..	50	.	..
46—up ..	134	97	3	205	260	0	16	..	..	..	..	..	90—115	70—80	..	20	..	..

Total Males	..	2,000
Total Females	..	1,875
GRAND TOTAL	..	3,875



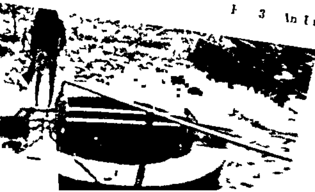
Fig. 1 An Old Lines



Fi ... A O I H ...



F 3 An I ... T ...



Fi 4 An O ...



pathological examination, treatment was then commenced, and as with hospital patients, standard treatments and standard mixtures prevail throughout our gardens. These were drawn up by me and although in no way original, they reflect accepted medical practice, and ensure thoroughness and efficiency. Fresh stock of each mixture is made up and distributed monthly.

These standard treatments form a large subject which is being dealt with in a future paper. In our study of the history sheets, we soon found patients being admitted for various complaints and being discharged, apparently cured, only to return in a few weeks or months with exaggerated symptoms of the same complaint, indicating a subsequent relapse. From our own observations and those of others, we decided on five constant factors to guide us, namely, confirm the *cause,* give stated *quantity* of *specific remedy* for a given *time* to produce an *end-point* of blood sterilization. Modifications for individual cases are limited to *rate* of administration and variations of *adjuvants.*

II.

Simultaneously with curative measures mentioned above, sanitary measures were carried out. Coolie houses are usually built in rows known as lines, and are either grass huts or the modern iron frame houses with corrugated iron roofs. Some of our lines were in such a bad state that reconstruction is taking place. Fig. 1

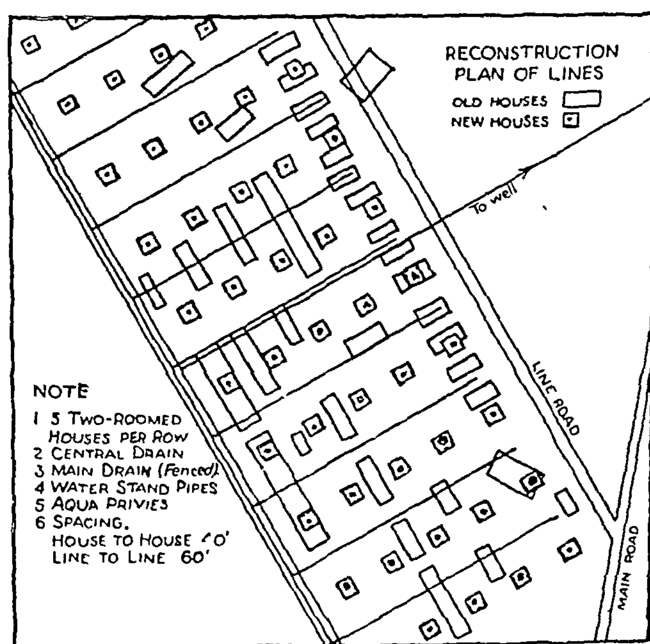


Fig. 1. Reconstruction of the Lines.

shows the method adopted. A large scale plan of existing houses was made, a plan of the proposed new houses and drainage was superimposed, and where a new house did not interfere with an existing one, the building was started. In this way, the old is gradually replaced without inconvenience to the occupiers. Plate LI, fig. 1,

shows a typical old line Plate LI fig 2 a close up of one of the old houses The spacing of these new houses is 40 ft apart and 60 ft from line to line The houses themselves provide accommodation for one large family or two small ones, and measure 20 ft square They are larger and more lofty than villagers around are used to and they are well above flood level

Water supplies have been improved and augmented Plate LI, fig 3, shows an old uncovered tank Plate LI, fig 4, an open well where no precautions have been taken to prevent even the grossest contamination of the water These things *are being done away with*, *engines are being used to pump water from covered wells* to tanks on high standards from which it flows by pipe lines to standpipes at suitable intervals along the main drain Cement surrounds are made to these

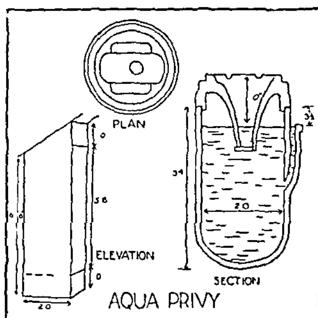


Fig 2 Clayton Lane Aqua Privy

Systems of conservancy are of the crudest, but experiments have been made with Clayton Lane Aqua Privies (Fig 2) and these have been found so satisfactory that they are being installed in increasing numbers The coolies appreciate their advantages and do use them

Sanitary gangs were started a year ago in all the lines to make and maintain earth drains, clear away rubbish, and do other sanitary work

III

Other preventive measures adopted may be briefly mentioned Emergency medical boxes containing standard mixtures drugs for injection, and surgical *apparatus were installed at convenient spots all over the gardens* The stock is replenished monthly

following rooms in order, surgical dressing room, office and day dispensary, pathological laboratory, operating theatre, drug store room and lying in ward Fig 4 shows the ground plan of the buildings at the central garden The hospital outbuildings comprise the kitchen food store out patient department mortuary and a range of isolation wards

This central hospital is just completed and a word may be said as to how it is being run Until recently patients were divided into three classes in patients, out patients who draw sick pay and get two or more doses of medicine per day, and line patients, who are convalescents or very light sick and while going to work take medicine morning and evening The relatives of in patients are given leave to attend them and this results in very bad nursing and the smuggling in of unsuitable

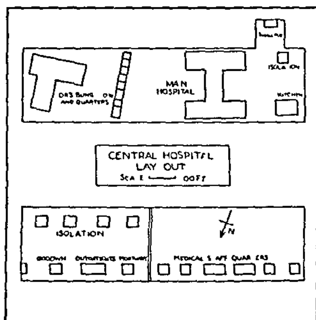


Fig 4 The Ground Plan of Central Hospital Buildings

food Out patients are most unsatisfactory Their treatment is inadequate, their diet cannot be supervised, they can more easily feign illness, and altogether they are an uneconomic factor which I propose to eliminate Those unable to work will in future become in patients their relatives will no longer attend them, but trained night and day attendants will be on duty in each ward Ample treatment and dieting can thus be assured

I must now endeavour to show the results obtained from these various activities I cannot place very much reliance on figures as they are misleading for this purpose except as given below The most significant fact is the increased number who turn out to work daily As an instance of this in a given month during the most busy season, 76 per cent of the total effective labour force turned out to work in control gardens where these changes had not been effected, whereas

Fortnightly, on pay-days, the coolies are examined and put under treatment if necessary. Daily house-to-house visits find others who are sickly, and by getting them in an early stage, much serious sickness is prevented. Carriers of malaria, hookworm and dysentery are constantly being found by examinations in our pathological laboratory. They are treated accordingly. Education of the cooly in health matters is attempted by placards and posters in all our hospitals, and frequent demonstrations and talks during the morning sick parades. The medical staff are given a weekly lecture on topical subjects and also have a small lending library of recent medical books. Expectant mothers get at least four months' leave with extra food, milk, cod-liver oil and malt, when required, and a tonic mixture three times daily over the whole period. Babies are brought to hospital daily till 2 to 3 months old. Plate LI, fig. 5, shows them. Fly and mosquito campaigns are going on in connection with sanitary gangs. The breeding places of mosquitoes are

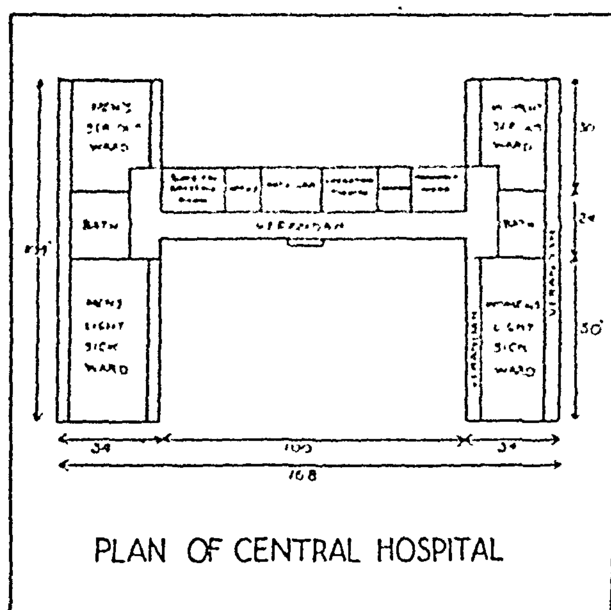


Fig. 3. Standard Hospital Plan.

abolished by drainage when practicable, otherwise use is made of Paris green, mixed with road dust, or river sand. Cinchona tablets obtained from the Government Factory are widely distributed with very good effect. It is hoped to make our new hospitals mosquito-proof. We use a large number of tonic pills, containing iron, arsenic and strychnine. All leprosy cases receive treatment, mostly by hydnocarpus oil and creosote injections. A big venereal clinic is dealing with syphilis cases and such cases of gonorrhœa which come to light. The latter, however, is not so readily detected.

The present hospitals are quite unsuitable and inadequate; Fig. 3 shows the plan of our standard hospital design. It is a large airy steel frame building, with cement finished brick walls, metal windows, good bath-rooms and lavatories. There are four main wards on the wings of the building, while the cross-bar comprises the

Date of last Muster

Discharged.	Remaining at end of month.

WEIGHT

URINE

CRANIAL NERVES 1 2 3 4 5 6 7 8 9 10 11 12

Motor Fu

Co-ordinat

Reflexes

Sensory

Mental St

Reaction

STOOL Frequency Amount Colour Odour Consistence Reaction

BACILLI Shiga Flexner Other

AMŒBA

FLAGELLATA

COCCIDIA

HELMINTHS Trematodes Cestodes Nematodes Ank Duod Nec Amer. Ascar Verm. Strong S. Trichuris

SIGMOIDOSCOPE

Ringworm
Leprosy
Other cause
Macules
Papules
Vesicles
Pustules
Scales
Scabs
Infiltration
Pigmentation
Ulceration
Floor
Edge
Discharge
Pathology

BLOOD.

Hb.
C. I.
Spec. Grav.
Coag. Time
Tonicity
Red Count
White Count
Polymorphs
Eosinophils
Basophils
Sm. lympha.
Large lympha.
Large mono.
Abnormals
Parasites

Aldehyde Test

_Medical Officer.

_Manager.

where these changes were in full action, the number turned out to work was raised to 83 per cent. This improvement in the group of gardens under discussion has been gradual, but is still progressing, and it promises to approach 90 per cent when present conditions have been maintained longer.

Then as to certain diseases, smallpox has become almost unknown owing to thorough vaccination, malaria has been reduced by 50 per cent. Spleen index is below ten per cent, whereas three years ago it was over 20 per cent. We had only one case of cholera in 1927, although it was widespread in the district, dysentery was reduced by 40 per cent. Hookworm is now present only as a subnocuous infection, and the bad water-logged anæmic cases which were so common are now almost unknown. Pneumonia mortality is still high, but with better hospital facilities we hope to reduce it. There is a big rise in the birth rate and a fall in the death rate.

The conclusions to be drawn from this work are as follows :—

(1) To prevent disease no one method is adequate, but every method must be combined and persisted in.

(2) The most important factor is to assure a thorough cure of each patient, and for this, follow-up treatment is necessary. This is impossible without keeping careful records. The elimination of carriers thus accomplished, probably does more than anything else to prevent disease. I would emphasize that the hospital is not in the front line of attack, one must go beyond the hospital, beyond even the sick people, to catch the apparently healthy, and nip disease in the bud. This is the keynote of success and of paramount importance.

(3) The second factor is a good water-supply and conservancy system. Apart from malaria, probably 90 per cent of sickness is due to this lack. The experience of others has been confirmed in these gardens, that the eradication of severe worm infection has a remarkable effect on the number of dysentery and respiratory disease cases.

(4) The third factor is adequate housing and sanitation.

(5) The fourth factor is a first class hospital and full equipment. This will not have the effect on the sick rate so much as the former factors mentioned, but will very materially reduce the death rate. It is hoped that by practical experience of treatment in hospital, patients will gradually learn the elements of health and hygiene and will be emulated to practise them.

The cost of disease is enormous, necessitating as it does the recruiting of new labour to replace wastage, outgoings in sick pay and attendances, lack of labour just when most needed to assure a large crop. Besides this, a 'C 3' population, even if they turn out to work, can only attempt a smaller task and do it in an indifferent way. The psychological effect of disease as a deterrent to *joie de vivre* must also be taken into account. What a debit balance does this afford ! It would be no exaggeration to put it at Rs. 3 per head per month.

The cost of prevention is also great, but not nearly so great as the former. Re. 1 per head per month spent for health for five years, what would it not buy in drugs and equipment, what would it not do in replanning, rebuilding and

redraining, and if followed by eight annas per head per month or even less for perpetuity, would we not be able to obtain vast results ?

The enemy of disease is being defeated on every side by single handed effort, but will never be crushed till all combine under one Generalissimo, not only to fight disease, but the callous indifference which perpetuates it And at the end of our best day, let us not forget that we are but unprofitable servants, we have done that which was our duty to do

APPENDIX

Examples of Standard Treatments

Malaria, Acute —Take thick and thin blood films, and examine these for parasites Give ʒ1 of mag sulph once followed by 1 doses of sodi bicarb in plenty of water three or four times daily Give cinchona pills eight a day for seven days, during which time the patient remains in hospital Follow cure by microscope When discharged, give six pills a day for 21 days In bad cases, or if vomiting is present, give intravenous, not intramuscular injections of quinine bihydrochlor 7 to 10 grs Inject slowly

Malaria, Chronic —Examine blood slides If parasites found, first give full course as above Treat anæmia with mist No 7 Do not discharge from hospital till blood is over 80 per cent Give full diet, green vegetables and fruit When discharged, give four cinchona pills and four tonic pills daily for a month

Cholera —Put patient to bed and give hot water bottles Take specific gravity of blood

If	1063, give	3 pints saline	Temperature, 99°F		
,,	1064 ,	4 ,, ,	Rate of injection,	ʒ1	per minute for first half
,,	1065 ,,	5 ,, ,,		ʒ2	per minute for second half
,,	1066 ,,	6 ,, ,,			

Composition of solutions	No 1	No 2
	℞ Sodi Chlor ʒ1	℞ Sodi Chlor ℥2
	Sodi Bicarb ʒ3	Calc Chlor grs 4
	Water to 1 pint	Water to 1 pint

Take specific gravity of blood and blood pressure every 12 hours at least Give pot permang 3 grs to a pint of water, add plenty of kaolin, allow unlimited quantity to drink Give atropin gr 1/100 sub cut every 12 hours Diet, barley water and five per cent glucose Add citrated milk only after three days

THE MEDICAL INSPECTION OF INDIAN SCHOOL CHILDREN AT SIMLA

BY

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Medical Officer of Health Simla

THE medical inspection of school children and school premises at Simla was begun by me in September 1923 Prior to this date, this work was not considered to be one of the duties of the Medical Officer of Health and no system of the kind existed The present system is unique because it exists nowhere else in the Punjab Province

Simla with its season population of about 45 000, collected within a restricted area, is perhaps particularly well situated for work of this nature

Until December 1924 only the primary classes of boys between the ages of 6 to 11 years were dealt with The total number so handled was 731 In late 1924, the Simla municipality, realizing the success of such work made a represen tation to the Punjab Government and recommended that Government should extend this work to all boys in Simla

The Government accepted this proposal and appointed a whole time sub assistant surgeon as school medical inspector, to work under my direct control Thus, 2 270 school boys came under medical supervision in 1925 The results obtained during 1925 were so good that Government re appointed the school medical inspector for 1926 and again for 1927, although Government decided that in future the expense should be borne entirely by the Simla municipality, which is now done With the aid of two lady doctors of the town, who worked in a voluntary capacity during 1926 the work was extended to all Indian girl schools in the town Thus 529 girls came under medical supervision This extension of the work is regarded as a triumph because the prejudice of mothers and the purdah system make such work difficult to introduce The work amongst the girls has been continued during 1927

The cost is estimated at approximately one anna per child per mensem ex cluding the cost for instruments, printing of stationery and medicines

The medical inspection of school children in the world generally is a work which is of comparatively recent birth

Following a sequence of events in England and Wales dating back to 1870, which time will not permit my entering into, it was not until 1907 that the public

Amœbic Dysentery.—Diagnose by examining stools and finding amœba. Keep patient in bed for 10 days at least, using bed-pan. Give mag. sulph. ℥1 at once, and repeat with ℥1 every morning. Give unlimited kaolin water to drink. On days 1, 3, 5, 7 give Yatren 0·5 gm. six times daily by mouth. On same days as above give 1 c.c. emetine sub. cut. On days 2, 4, 6, 8 give Yatren enema 3·0 gm. in 200 c.cs. water at 80°F. Patient can be discharged and have stovarsol one tablet twice daily. Test cure by examining stools also bowel by sigmoidoscope.

Hookworm Disease.—Normal treatment as follows: m. 2 of carbon tetrachloride per year of age, maximum m. 30. added to m. 1 of oleum chenopodium per year of age, maximum m.15. Give purge the night before, carbohydrate meal at 6 A.M., half this medicine at 7 A.M., half at 8 A.M. and mag. sulph. at 10 A.M. Note number and kind of worms passed. Give kaolin if diarrhœa continues. Give pregnant women half maximum dose. Severely anæmic cases should be given ol. chen. m. 2 per day for a week and kept in bed.

Child Birth Cases.—Examine height of uterus every day and enquire of discharges. Height should be five inches after birth and decrease half an inch daily. Report rise of temperature and pulse above 100 to medical officer at once. Give mist. No. 5 for seven days after delivery, then mist. No. 7. Give ol. ric. ℥1 48 hours after birth.

Examples of Standard Mixtures.

No. 5.

Mist. Ergot.

℞ Ext. Erg. Liq. m. 10.
Ac. Sulph. Dil. m. 10.
Tr. Hyocyam. m. 10.
Ext. Glyc. Liq. m. 20.
Aq. ad ℥1.

No. 7.

Mist. Ferri et Ars.

℞ Ferri et Ammon Cit. grs. 5.
Liq. Arsen. m. 3.
Tr. Aurantii. m. 3.
Aq. ad ℥1.

Changes amongst the children we are dealing with are inevitable This tends to retard the rapid and complete success of the work

It is estimated that at the beginning of each school year (1st March), 60 per cent of the children who have attended during the previous year return to Simla, while the places of the remaining 40 per cent are taken by new comers In spite of this difficulty, the work has met with marked success

The following are the results obtained during the past four years —

During 1923 24, out of 731 boys examined, 67 per cent were referred for treatment at the first inspection whereas this figure was reduced to 33 03 per cent by the end of 1924

As already stated during 1923 24, only the primary classes at the boys schools were dealt with, consequently these results do not bear direct comparison with those of subsequent years

In 1925, 81 per cent of the boys were referred for treatment at the first series of inspections while by the end of the year, this figure was reduced to 30 per cent

In 1926 at the first series of inspections, 43 per cent of the boys and 75 per cent of the girls were referred for medical treatment also 15 per cent of the boys and girls were recommended for attention by the masters and mistresses for uncleanliness and other minor conditions

By the end of the year, these figures were reduced to 15 per cent of the boys and 43 2 per cent of the girls requiring further recommendation for medical treatment, while 21 per cent of boys and 20 per cent of girls still required attention by the masters and mistresses

In 1927, at the first series of inspections, 39 6 of the boys and 63 per cent of the girls were recommended for medical treatment while 44 7 per cent of the boys and 37 3 per cent of the girls required attention by masters and mistresses

I will now briefly deal with the most important defects found —

(1) *General Physical Condition*

Averages of height, weight and chest measurements for Simla school boys and girls of varying ages were prepared in 1925 26 Simla children maintain a similar height to English children up to the age of 14 years, but after this age, they are less in height In weight, they are generally less than English children throughout the ages Simla children reach half their adult weight at 12 years in a similar way as English children do The boys and girls now attending the 27 schools at Simla are of good physique and they comply with the standards already referred to These results have been achieved by constant medical supervision and treatment, together with a system of regularized exercise by *a games for all movement* and with a scheme for the supply of mid day meals for the children

(2) *Diseases of the Eyes and Defective Vision*

The most usual forms of eye disease found are conjunctivitis and trachoma in its varying stages In a few cases trachoma has led to corneal opacities, which

conscience was really awakened to the unsatisfactory condition of school children in England.

As we know, progress at first was slow, but gradually clinics were opened for treatment, and in 1912-13 the Board of Education issued regulations for the first time, sanctioning grants-in-aid for the medical treatment of school children, the total grant being limited to £60,000. Local education authorities were thus enabled to increase their arrangements for treatment by clinics and in other ways. There are now more than 1,395 clinics provided by 312 out of the entire 317 local education authorities in England. One of the most recent being that which was opened at Birmingham in September 1926.

In 1923-24 the Board of Education allowed a grant up to £600,000 for the purpose of inspection and treatment, while the total gross cost of the school medical services in that year amounted to £1,220,268 which is about one-fifth the total sum spent on public elementary education. This is a very small premium for rendering education a useful asset and for improving the physical and financial well-being of the nation.

The need for such work in England and Wales was obvious when, in 1916, it was estimated that of the six million school children—

(1) Three millions were in need of dental treatment.
(2) Half a million had bad eyesight and could not take advantage of their lessons.
(3) Half a million suffered from ear and throat diseases.
(4) Half a million were verminous.
(5) Half a million were ill-nourished.
(6) And many suffered from skin diseases and tuberculosis.

If this was the state of affairs in England and Wales in 1916, what is the state of such children in India, and would their physical and mental condition bear comparison with those of England and Wales ?

The system of medical inspection at Simla, which is now in practice, has been evolved by closely studying similar systems in other parts of the world.

The system embodies :—

(1) The medical inspection of each child, once every two months, with a view to the prevention and cure of disease.
(2) The assured treatment of affected children.
(3) Reports of the above results, which are combined to form an annual report.
(4) A monthly inspection of school premises, followed by reports combined to form an annual report.

Time will not permit my entering into the details of the work, but for those who are interested, I have prepared a cinema film which I hope to show during this Congress.

The Simla population is very largely a seasonal one, fluctuating with the change of Government office employees.

the more chronic cases is operation I mention this because of the marked opposition which we have experienced, until recently, from parents against operative measures It has taken nearly 3 years of patient education of the parents in preventive medicine to get their consent to operative measures for their children who were found to be suffering from enlarged tonsils and adenoids To day we experience considerably less opposition from parents where operation is necessary

From a bacteriological examination of 106 cases of enlarged tonsils I found that from —

51 cases *Staphylococcus albus* was recovered
36 cases gave a mixed gram positive bacillary growth
9 cases showed a gram positive diplococcus
3 cases gave a mixed growth of gram positive bacilli and staphylococci
5 cases gave no growth
2 cases were diphtheria carriers and were treated

In no case was the tubercle bacillus recovered

I find that children suffering from chronic enlargement of tonsils and adenoids improve considerably both in physical and mental condition, after operation for these complaints

It has been stated that 37 per cent of London school children have adenoids and that 72 per cent have enlarged tonsils as well In Vienna in 1921 10 per cent of the children were suffering from these diseases and in Natal in the same year, 8 2 per cent were suffering

It is said that treatment of tonsils and adenoids reduces the incidence of infectious diseases

(5) *Smallpox and other Infectious Diseases*

Not a single school child at Simla escapes either primary vaccination or re vaccination against smallpox With the advent of the season population to Simla from the plains smallpox is always introduced, yet during the last 4 years only 3 school children have been attacked with modified smallpox It is stated that 50 per cent of school children in England are unprotected against smallpox Any child found suffering from any other infectious disease at Simla is at once isolated from the school School closure is, generally speaking found unnecessary

(6) *Malaria and Enlarged Spleen Incidence*

Acute malaria is not contracted at Simla All acute cases prove to be relapses from an original infection of this disease in the plains In 1925 4 cases of acute malaria were recorded Enlarged spleen incidence, at the first series of inspections, was 16 4 per cent while by the end of the year, the incidence was 0 3 per cent In 1926 12 acute cases were recorded

Spleen incidence was much reduced when compared with [illegible] 1925 Girls suffered more than boys In 1927 enlarged spleen incidence was only 0 5 per cent

in some instances accounts for the inability of improving the vision of such cases by spectacles. The Simla municipality provides an annual grant for the provision of spectacles to children whose parents are too poor to pay. In 1925, 4·1 per cent of the children were found suffering from defective vision. These cases were corrected with spectacles. In 1926, 1·5 per cent of the children were suffering and were treated. In 1927, 1 per cent were suffering, and their vision was corrected with spectacles. Hypermetropia and hypermetropic astigmatism accounted for the majority of the cases.

It has been estimated that 10 per cent of English school children suffer from visual defects, and the condition is said to be worse in large cities as compared with county districts.

In England, difficulty has been experienced by children not wearing, or breaking, the glasses supplied to them. On the contrary, all children at Simla who have been fitted with spectacles wear them. This is achieved by the constant medical supervision of each child.

(3) *Dental Diseases.*

In 1925, 11·4 per cent of the children were found suffering from dental diseases. In 1926, 15 per cent required treatment for dental diseases. During that year, treatment was privately arranged for those children whose parents agreed to pay for the treatment. By the end of the year, the percentage requiring treatment was reduced to 5·4 per cent but many of the poorer children did not receive treatment. By repeated representations concerning the treatment of this group of diseases, the Simla municipality provided a special grant, in 1927, for the treatment of those children whose parents were too poor to pay. At the beginning of 1927, 13·7 per cent required treatment, but by the end of the school year only a few remained to be treated.

It has been estimated that 54·6 per cent of children examined in England and Wales suffer from dental diseases, while a large proportion of these have four or more decayed teeth.

(4) *Enlarged Tonsils and Adenoids.*

In 1925, 51·3 per cent of the children were found to be suffering from enlarged tonsils ; by the end of the year the incidence was reduced to 7·9 per cent. In 1926, 22 per cent were found suffering from enlarged tonsils ; by treatment, the incidence was reduced to 3·7 per cent by the end of the year. In 1927, 15·3 per cent were found suffering, and the incidence was further reduced by the end of the year. I find that there is close correlation between enlarged tonsils and adenoid cases with climatic conditions. During the rains, with a high atmospheric humidity, predisposed children suffer considerably. Hindu children appear to suffer more than Mohammedans, while children between the ages of 7 and 12 years are most affected. I find that children suffering from acute or semi-acute enlargement of the tonsils frequently recover under medical treatment, while the only cure for

I do not wish to infer that this work only consists of the detection and cure of diseases, our ideal aim is the increase and spread of knowledge in health teaching, for after all the school is the logical place to inculcate the value of preventive medicine Our school medical organization coupled with our propaganda work at Simla has achieved a success, during the last four years, which I never anticipated could be possible, when I introduced this work in September 1923

In conclusion, I wish to record that the routine work for the boys' schools is in charge of a whole time Indian male doctor (Dr Mohan Singh) while that at the girls' schools is now in charge of a part time lady doctor (Dr Miss Rosario)

I realize that children infected with malaria, improve with the climatic change to Simla, apart from medical treatment.

(7) *Goitre.*

Goitre is not a disease which is much found amongst our children, although McCarrison writes, '20 per cent of the population in the Himalayas suffer from Goitre.' I attribute the comparative absence of this disease amongst our children to the fact that a large proportion have an annual change to the plains. Cases are treated by the iodine method.

(8) *Ear Diseases and Defective Hearing.*

The percentage of ear diseases and defective hearing is very low amongst the children. Many suffer from wax in the ears, which is most pronounced during the rains. A few cases of middle-ear disease have been detected and submitted to operation.

(9) *General Cleanliness.*

Under this heading comes the state of the head, body, hands, teeth and clothes. Apart from the routine inspections by the school doctors, weekly inspections are made by the masters and mistresses for cleanliness amongst the children, and registers are maintained by them of their results. Annual prizes are awarded by the Simla municipality to the cleanest children at each school. This acts as an incentive for the children to keep themselves clean. It would be wearisome to refer to the many statistics relating to this heading. It is sufficient to add that, since regular school medical inspection was introduced at Simla, there has been a very marked improvement in the general state of cleanliness amongst the children. The standard is now high and bears comparison with that of western countries.

(10) *Co-operation between School Work and Infant Welfare Work.*

An interesting feature of this work is the co-operation which exists at Simla between the school work and that of the Infant Welfare Institution. Infant welfare index cards for toddlers, whose career has been guided by the Lady Health Visitors from birth to the toddler state of life, are passed to the school doctors. In consequence, a complete previous history of such children is obtained at the time of their entering any of the 27 schools at Simla.

(11) *Concluding Remarks.*

These statistical results show that a systematically organized medical inspection of school children has a direct beneficial bearing on the community and in relation to preventive medicine.

It is a well known fact that *parasitic diseases* are widespread in Japan. The reason for this is chiefly the habit of the Japanese to eat fish (mostly fresh-water fishes) raw or insufficiently cooked, to drink water from wells and rivers in unboiled condition and lastly to walk in the open barefooted. For these reasons these diseases are also found amongst ships' crews.

It is further worthy to note that so far no case of trypanosomiasis appeared in Japan, neither amongst the population on land nor on any Japanese ship sailing to tropical countries, although *Trypanosoma lewisi* is very widespread amongst rats in Japan.

SUPPLEMENT TO THE STATEMENT OF Prof. F. KATSURADA AND HIS CO-WORKERS, Dr. M. YOSHINO AND Dr. K. ISHIMITSU.

BY

K. TANAKA.
Tokio, Japan.

With reference to the report submitted by Dr. Katsurada and his co-workers of the O. S. K., in regard to the medical organization of Japanese Shipping Companies, I should like to supplement it with a few remarks on behalf of N. Y. K., as they may not be fully acquainted with our particular organization and activities.

Research is encouraged as much as possible and every surgeon of the company has to report his studies to the Superintendent and the Head Office, the former gives necessary instructions to the surgeons in connection with these reports. The N. Y. K. Surgeons' Association publish a magazine containing medical news and reports of the company's surgeons, besides news from outside sources. Since the establishment of N. Y. K. Seamen's Hospital, several investigations of Tropical and Seamen's diseases had been made and reported in the Association's bulletin.

Regulations for Ships' Surgeons.—I regret I can only corroborate what has been said about the lack of official regulations for carrying ships' doctors in Japan, and I hope the Government will take action to remedy this regrettable state of affairs, as it is a fact that a great many ships outside the big companies carry no doctors.

Malaria.—So far as our company is concerned, our record shows much more cases of malaria on our steamers for Bombay, especially the steamers berthed in the old dock, Bombay, as compared with Calcutta.

Beri-beri.—Precautions are taken on our steamers and the results have been satisfactory. Following the example of the Navy, we formerly used barley and rice, but about 2 years ago this method was changed in favour of rice bran mixed with pea soup, coupled with necessary attention to the diet. The Japanese old

ORGANIZATION FOR RESEARCH WORK IN SHIPS AND TROPIC DISEASES IN JAPAN.

BY

PROF. DR. MED. ET DR. PHIL. F. KATSURADA,

Director of Institute and Hospital for Seamen's and Tropical Diseases,

DR. MED. M. YOSHINO,

Chief Physician of O. S. K. and Co-operator at Institute for Seamen's and Tropical Diseases,

AND

DR. MED. K. ISHIMITSU,

Ship's Physician of O. S. K. and Co-operator at Institute for Seamen's and Tropical Diseases.

THOUGH the three tasks, viz.:—

1. Research in ships and tropical diseases,
2. Treatment of patients suffering therefrom,
3. Training up of ships' physicians and specialists for tropical diseases,

would be ideal conditions for every institute for ships and tropical diseases, tl exists not yet an institute in Japan which fulfils these three conditions.

There are however different hospitals for seamen, but for therapeutical purp(only. In this connection in the first instance the therapeutical organizations Nippon Kaiin Yekisaikai (the Japan Seamen's Aid Society) must be mentior of which the first was opened at Yokohama in 1896, then followed a small on(Kobe in 1900 and another one at Nagasaki in 1902. By and by also at other p(small hospitals were opened and on the other hand the existing ones enlarged : improved, for instance at Yokohama, Kobe and Osaka, at present the last on(the largest (80 beds).

All these hospitals were only equipped for therapeutical purposes, but various reasons were not suitable for research work in ships and tropical disea as well as training of ships' physicians.

MORTALITY AND BIRTH STATISTICS OF EUROPEANS IN THE NETHERLANDS EAST INDIES.

BY

CH. W. F. WINCKEL,

Inspector of the Public Health Service for West Java.

I. INTRODUCTION.

(1) IN the Netherlands East Indies every death case of Europeans is filed by the registrars who get the death certificates from the physicians. A special certificate is placed in a sealed envelope, and sent to the inspector of the Public Health Service to be used for statistical purposes. It records every detail of the cases, no name however being mentioned, so as to guard professional secrecy.

(2) Births are also recorded by the registrars.

(3) In this country not only the incoming white people and their offspring have the legal status of Europeans, but also the Eurasians, Japanese, and a few Chinese and Natives who have been able to secure that legal status. Thus the census of 1920 showed the following results :—

TABLE I.

The European population of the Netherlands East Indies ; census of 31st December, 1920.

Age.	Male.	Female.	TOTAL.
0—14 ..	27,651	26,531	54,182
15—19 ..	7,369	7,153	14,522
20—54 ..	54,465	36,106	90,571
55—64 ..	3,772	3,132	6,904
65, etc. ..	1,513	1,668	3,181
TOTAL ..	94,770	74,590	169,360

Of these were : Dutch	154,099 (Eurasians included).
From other European countries ..	7,277
American, Australian, Armenian ..	661
Japanese	4,148
Chinese	538
Natives	1,284
Unknown	1,403
TOTAL ..	169,360 people.

method certainly gave good results as reported to the fifth Congress held at Singapore, and as regards the new method it is perhaps too early to form definite conclusions at present, but generally speaking the results so far are deemed satisfactory

Training of Ships' Surgeons—In regard to the remarks made by O S K 's representative in this respect, I should like to mention that after qualifying N Y K surgeons are generally sent to the N Y K Seamen s Hospital for a period of training before joining the ship (Before establishment of the hospital they had a certain course at Yokohama Office)

N B—The name N Y K Seamen s Hospital—This hospital is not carried on by the company directly, still it received a certain amount of funds from the company and it has been run under the name mentioned above

This increased number of adults decreases gradually, but suddenly the group of 50 years diminishes badly, and thus the group of old age is much smaller than in countries with a normal population.

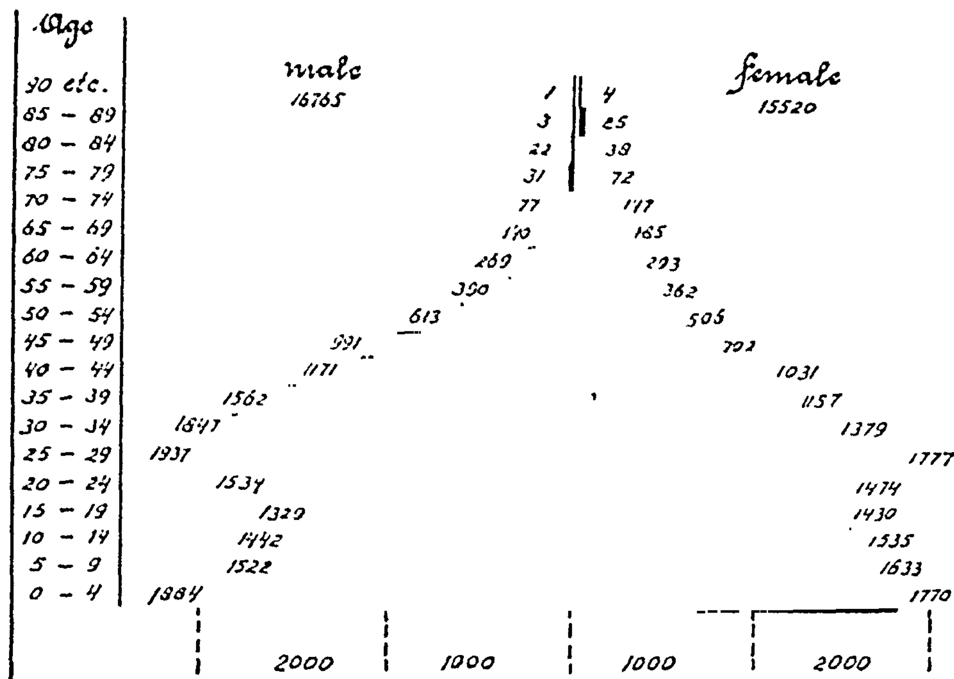


Fig 2. The age and sex distribution of the European population of Batavia and Meester Cornelis, 1st January, 1925.

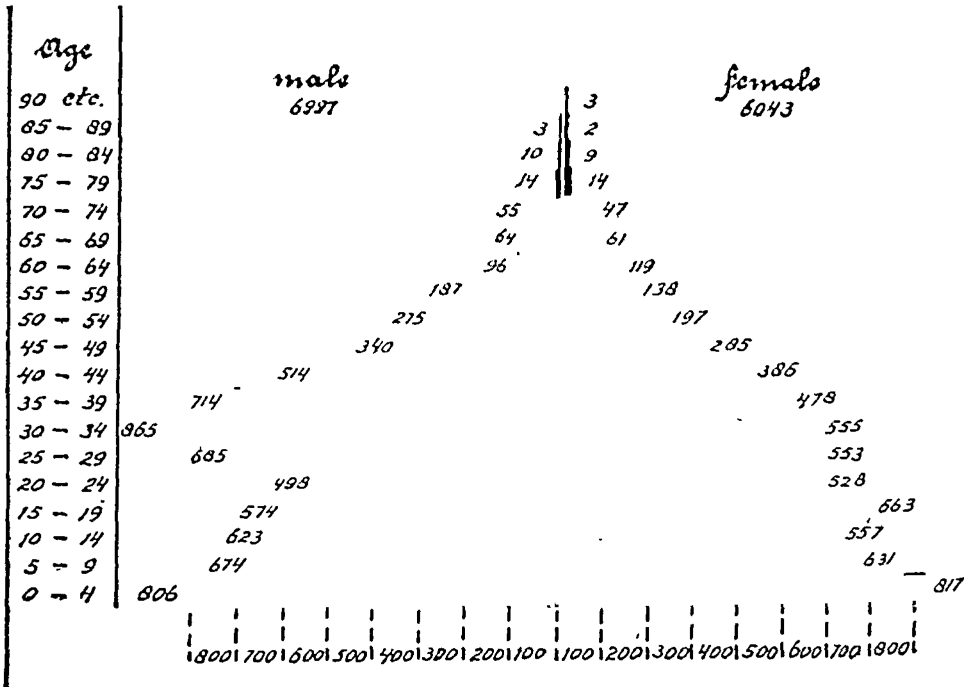


Fig. 3. The age and sex distribution of the European population of Bandung, 31st December, 1922.

(2) This increase in the number of adults (20 to 50 years old) is of course caused by the influx of officials, army people, commercial people and planters.

(4) A certain number of these Europeans stay here only for some years. They come unmarried or newly wed to the tropics, mostly after medical examination they work here 20 or more years, raise families, and leave India with their pension. They arrive in this country after the period of children's diseases and leave before the infirmities of old age. They contribute, however, in a way to infant mortality as their families are mostly raised here.

Another group of Europeans stays in the tropics; the proportions of these two groups is unknown.

(5) As a consequence of these circumstances and of the numerous transfers of government officials, the city of Batavia, e.g., with 29 000 Europeans, registers yearly nearly 4 000 departures, and upwards of 4 000 new comers. Therefore it is impossible to make a comparative study of local importance of divers causes of death; this is only possible for infectious diseases with a short incubation period e.g., typhoid fever.

II. The European Population of the Netherlands East Indies according to Age and Sex

The last census was held in 1920, but it is impossible to use its results for a 'pyramid' because, e.g., all persons of 0—15 years old were put together without discrimination. Only the larger communities register their population and so I can produce 'pyramids' of some towns only, not of all the Europeans in this country.

For comparison, I start with the pyramid of Holland.

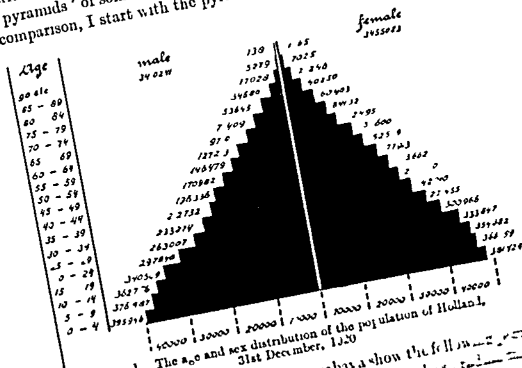


Fig. 1. The age and sex distribution of the population of Holland, 31st December, 1920.

The figures of Batavia, Bandung and Sourabaya show the following [illegible]

(1) The decrease of the number of persons is more or less [illegible] the 20th or 25th year. Then there is a sudden increase, especially of [illegible]

In column 4 of this table a normal population is mentioned: this is the population of Sweden in 1880.

When comparing columns 3 and 4, we see the following facts:—

(*a*) The groups of 0—20 years number only 38 per cent, instead of 42½ per cent.

(*b*) The groups of 20—50 years number 52 per cent, instead of only 38½ per cent.

(*c*) After the 50th year there remains only 9¾ per cent, instead of 19 per cent.

As the Europeans of this country mostly originate from Holland, I compared West Java with Holland; *see* Table III.

TABLE III.

Population of Holland (census of 1920): *mortality of the last years, compared with West Java.*

Age.	Number.	Per cent.	Normal population.	Crude Death Rate. Total.	Crude Death Rate. Per cent.	Standardized death rate.
0— 4 ..	777,370	11·30	12·30	19,569	25·17	3·10
5— 9 ..	743,686	10·82	10·62	4,192	1·96	0·59
10—19 ..	1,391,494	20·26	19·54	..	..	..
20—29 ..	1,133,268	16·50	15·63	3,795	3·35	0·52
30—39 ..	908,136	13·22	12·26	3,722	4·10	0·50
40—49 ..	748,893	10·97	10·73	4,449	5·94	0·64
50—59 ..	558,821	8·14	9·32	6,814	12·19	1·13
60, etc. ..	603,596	8·79	9·60	34,461	57·09	5·48
Unknown ..	50	..	..	..	..	..
Total 1921 ..	6,865,314	100·00	100·00	77,002	11·13	11·96
„ 1922 ..	..	..	..	..	11·43	12·28
„ 1923 ..	..	..	..	..	9·93	10·67
„ 1924 ..	..	..	..	..	9·80	10·53
West Java 1926	68,231	..	..	848	12·43	17·57

Holland differs only slightly from the standard population and has a crude death rate of 10 to 11 per cent yearly. When comparing the crude death rates only, West Java is not so bad, a mortality of 12·43 per cent in 1926, but, when taking into account the abnormal composition of its population, the situation is greatly changed.

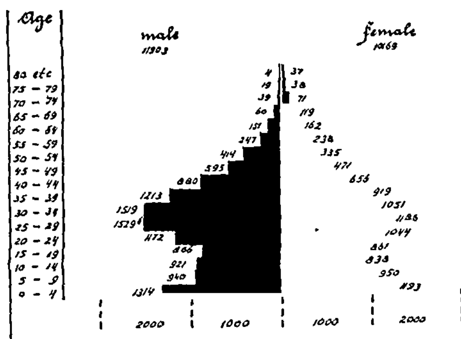


Fig 4 The age and sex distribution of the European population of Soerabaya.

(3) Table I and the diagrams show also the numerical predominance of the male sex.

For West Java I tried to make a better partition than the census results allowed, by supposing for its European population (at present 68,231) the same composition as in Batavia and its suburb Meester Cornelis (32,282) May be by so doing I commit a small error, but this is unavoidable, because there are no better data. Thus the next table deals with the supposed number of the different age groups.

TABLE II.

European population of West Java; supposed number of the different age groups, mortality in 1926.

Age.	Supposed number	Per cent.	Normal population	Crude Death Rate. Number	Crude Death Rate. Per cent	Standardized death rate
0— 4 ..	7,882	11·55	12·30	177(14)*	22·45	2·76
5— 9 .	6,360	9·32	10·62	13(1)	2·05	0·22
10—19 .	11,806	17·32	19·54	24(2)	2·03	0·34
20—29 .	14,593	21·39	15·63	58(4)	3·97	0·62
30—39 .	12,072	18·57	12·26	102(8)	8·05	0·99
40—49 .	8,258	12·10	10·73	112(8)	13·56	1·45
50—59	3,924	5·75	9·32	132(10)	31·64	3·13
60, etc.	2,730	4·00	9·60	230(16)	84·25	8·01
TOTAL ..	68,231	100·00	100·00	848(73)	12·43	17·57

* In brackets the number of cases (73), whereof no certificate was received In these cases the age was unknown I mentioned them separately as there are some, perhaps, who do not agree with my method of adding these cases proportionally to the death cases with known age.

This diagram shows that in Holland 44·6 per cent of the deceased were 60 years and older; in West Java 22·4 per cent only.

In Tables II and III it was shown that in Holland 8·79 per cent and in West Java 4 per cent of the population reaches the age of 60 years and older. Thus the risk of death for old people is about the same in Holland and in this part of the tropics.

IV. Birth Rate in West Java.

The infant mortality is, roughly speaking, proportionate to birth rate. In 1905 there lived in West Java 20,760 Europeans; their birth rate was 721, i.e., 34·73 per cent. For 1917 to 1926 *see* Fig. 6.

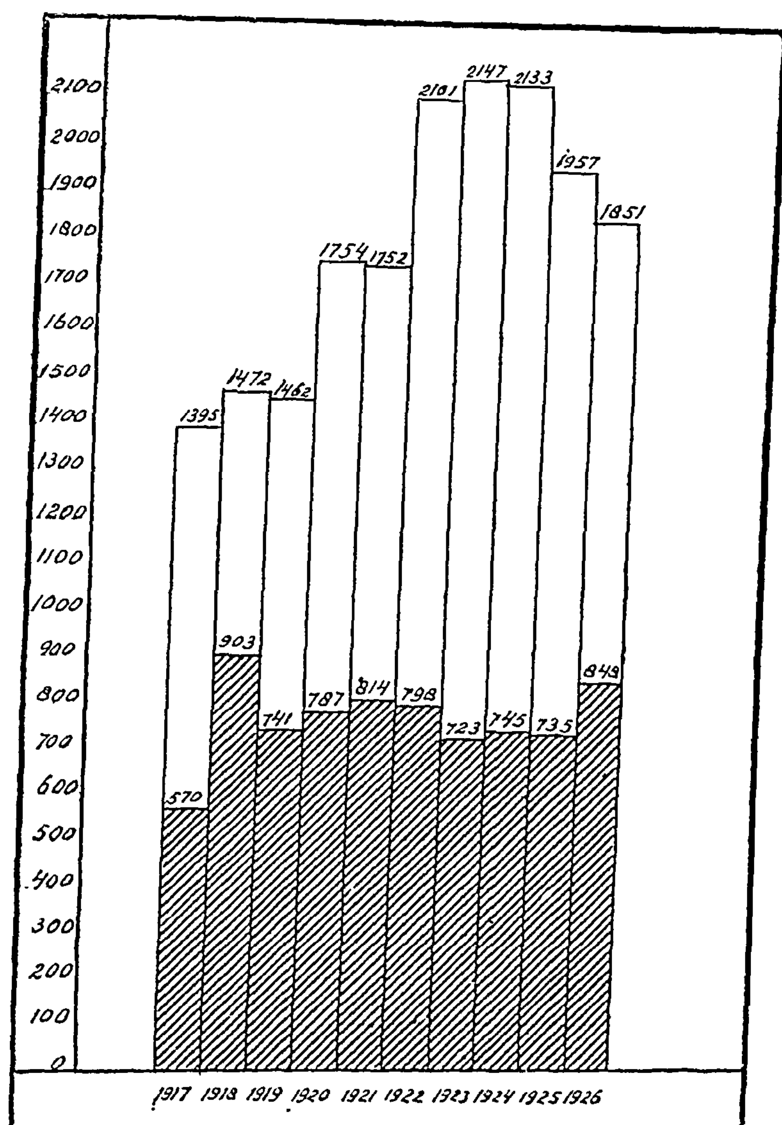


Fig. 6. Europeans in West Java; birth and death rate of 10 years.

The curde death rate is greatly deceiving, and so it is necessary to calculate the so-called standardized death rates, as introduced into vital statistics by Korösi(1) (Budapest).

The standardized death rate of Holland varies in the last years from 10·53 to 12·28 ; in West Java it was in 1926 (a normal year, without epidemics of smallpox, cholera or influenza, and with only a slightly increased occurrence of typhoid fever) 17·57, that is, nearly half as much again as in Holland. Later on we will speak about the causes of this high figure.

III. Specific Age Group Death Rates.

It is interesting to ascertain the proportion of the various age groups of West Java's Europeans in the death rate, and to compare the figures with those of Holland (*see* Fig. 5).

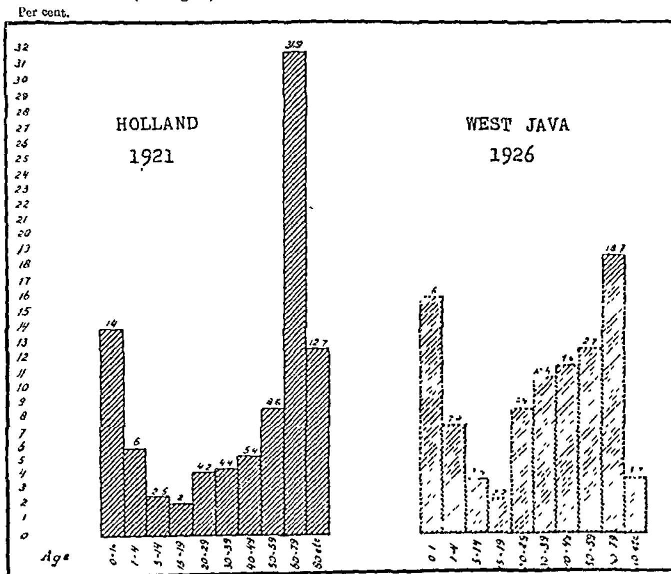


Fig. 5. Death rate of West Java (1926) compared with Holland (1921). Percentage of deaths in the various age groups.

TABLE IV.

Mortality from the principal causes of death in Europeans in the Netherlands East Indies as compared with Holland and England; all ages.

Causes of death.	N. E. I., 1919—1925. Pop. 1920 : 169,708		Holland, 1924. Pop. 7,263,893		England and Wales, 1923. Pop. 38,403,000	
	Total.	Per cent.	Total.	Per cent.	Total.	Per cent.
1, 2. Typhoid fever ..	490	4·39	158	0·23	450	0·10
3. Malaria ..	635	5·69	6	0·01	81	0·02
4. Smallpox ..	38	0·34	..	..	6	..
5. Measles ..	19	0·17	260	0·37	5,316	1·19
6. Scarlet fever ..	..	..	54	0·08	993	0·22
7. Whooping-cough ..	19	0·17	576	0·83	4,162	0·94
8. Diphtheria ..	69	0·62	237	0·34	2,722	0·61
8*a*. Dysentery ..	262	2·35	4	..	?	?
9. Influenza ..	303	2·72	590	0·85	8,461	1·90
10. Cholera asiatica ..	16	0·14	..	..	..	..
11, 12. Other inf. dis.	107	0·96	249	0·36	1,803	0·40
13—15. Tuberculosis ..	970	8·70	7,725	11·13	40,788	9·17
16, 17. Cancer, etc. ..	573	5·14	8,133	11·73	48,668	10·94
18. Apoplexia ..	427	3·83	4,911	7·08	27,348	6·15
19. Heart diseases ..	561	5·03	6,444	9·29	56,886	12·79
20—23. Bronchitis, etc.	1,078	9·71	9,130	13·16	71,711	16·12
24—27. Intest. aff. ..	569	5·11	2,384	3·42	18,541	4·17
28. Cirrhosis hepat. ..	78	0·70	268	0·39	1,774	0·40
29. Nephritis ..	453	4·06	2,369	3·41	12,500	2·88
30. Aff. fem. genit. ..	17	0·15	75	0·11	1,064	0·24
31, 32. Pregnancy, puerp.	148	1·32	436	0·63	1,892	0·42
33. Malformations ..	350	3·14	1,986	2·86	21,861	4·91
34. Old age ..	539	4·83	5,292	7·62	25,344	5·70
35. Accidents ..	361	3·24	1,917	2·76	13,158	2·96
36. Suicide ..	165	1·49	452	0·65	3,949	0·89
37. Other causes ..	2,097	18·82	12,288	17·57	69,301	15·58
38. Ill-defined dis. ..	800	7·18	3,413	4·92	1,713	0·39
TOTAL ..	11,144	100·00	69,357	100·00	444,785	100·00

When considering not the number of births only, but also the increase of the population (42,364 in 1917, 68 231 in 1926), we see a constant decline of the birth rate specially of the last four years This drop of the birth rate is seen during the last decennia in every civilized country, and it is not necessary to waste many words on this subject In 1905 the birth rate was 34 73 per cent, in 1926 27 13 per cent * only still somewhat higher than in Holland where it was (1920—1923) 26 87 per cent

In 1926 we had in West Java 1 851 live births in this same year 121 infants (0—1 year old) were reported dead i e 6 54 per hundred live births In Holland (1924) this figure was 6 06 per cent slightly lower than in West Java Considering the fact that Holland has a low infant mortality compared with other civilized countries, we are entitled to the opinion that infant mortality in this part of the tropics is not abnormally high

Infant mortality is not, therefore, responsible for the high standardized death rate of this country Mortality due to old age is not responsible The cause of the high death rate is to be found in the interjacent groups

V Causes of Death

The appendix of this paper shows the causes of death of Europeans in the Netherlands East Indies (1919—1925) compared with Holland (1924) This list contains only 11,141 deaths, and its number would be much larger if all registrars had sent the death certificates to the Public Health Service

For a comparison of the figures it is more convenient to use the so called abbreviated international list Table IV shows the figures of the Netherlands East Indies compared with Holland and England

These figures are instructive, they lead to the following considerations —

(1) Nearly 7 out of every 100 deaths were caused by infectious intestinal diseases typhoid fever, dysentery and cholera, the latter in a much lesser degree, this disease not being endemic in this country

(2) In nearly six out of every 100 cases death is imputed to malaria

(3) Measles, scarlet fever and whooping cough are of less importance than in European countries

(4) The lesser importance of the diseases of old age (malign tumours, apoplexia, heart diseases and senility) is clearly caused by the relative small number of old people in the tropics I am not entitled to give an opinion about the possibility of other influences climate, manner of living, etc

(5) The different forms of tuberculosis are of somewhat lesser importance than in Europe, partly, perhaps, because the incoming Europeans have been examined before

* Live births only

TABLE V.

Causes of Death in West Java, 1915—1926.

Causes of death.	Batavia and Mr. Cornelis, 1915–1926.	Bandung, 1917–1926.	Other places, 1917–1926.	TOTAL WEST JAVA.	
				Number.	Per cent.
1. Typhoid fever ..	232	64	74	370	5·22
2. Malaria	223	9	52	284	4·01
3, 4. Smallpox	21	14	9	44	0·62
5, 6. Measles	5	2	3	10	0·14
7. Whooping-cough ..	8	1	2	11	0·15
8. Diphtheria	17	7	9	33	0·16
8*a* Dysentery	98	17	63	178	2·51
9. Influenza	79	32	45	156	2·20
10. Cholera	73	8	15	96	1·35
11, 12. Other inf. diseases ..	40	6	18	64	0·90
13. Pulmonary tb. ..	296	53	123	472	6·66
14. Tb. of the brains ..	4	3	9	16	0·22
15. Tb. of other organs ..	10	3	8	21	0·29
16. Cancer, etc.	271	71	87	429	6·06
17. Meningitis	34	4	10	48	0·67
18. Apoplexia	172	51	77	300	4·24
19. Heart diseases ..	165	52	79	296	4·18
20. Ac. bronchitis ..	25	4	3	32	0·44
21. Chr. bronchitis ..	22	2	5	29	0·41
22. Pneumonia	246	36	70	352	4·97
23. Other dis. of the lungs, etc.	234	59	75	368	5·19
24. Dis. of the stomach, etc. ..	33	5	6	44	0·61
25. G. enteritis	119	26	40	185	2·61
26. Appendicitis	17	3	4	24	0·33
27. Hernia	18	8	6	32	0·44
28. Cirrhosis hepatis ..	15	11	6	32	0·44
29. Nephritis	179	35	55	269	3·80
30. Dis. of the fem. genit. syst.	9	1	3	13	0·18

(6) The other pulmonary diseases (acute and chronic bronchitis, pneumonia etc) do not have the same importance as in England and Holland neither do the infectious diseases with pulmonal complications (measles and whooping cough as mentioned before)

(7) The non infectious intestinal diseases (of the stomach enteritis appendicitis hernia) are somewhat more frequent

(8) The same applies to cirrhosis of the liver which I am inclined to impute to the greater consumption of spirits

(9) Nephritis is even more important than in Holland which country has a bad reputation in this respect

(10) External causes and suicide are more frequent than in Holland and England As to suicide, I think this is caused by the greater liability of the psychic equilibrium of Europeans in the tropics

(11) The figures for puerperal fever diseases of pregnancy and child birth are twice as high as in Holland, and three times as high as in England This increased mortality may be connected with lack of medical attendance in the many small towns of this country

For more particulars I refer to the Appendix In this complete international list the figures of England could not be mentioned as only the abbreviated list of this country was at my disposal

From this complete international list one can gather many particulars at present I mention only some marked characteristics plague dengue syphilis lepra beri beri tropical sprue, alcholism, abscess of the liver these, of course are more to be reckoned with here than in Holland In the latter country 1 to 3 of all tuberculosis deaths is non pulmonary, in the Netherlands East Indies only 1 to 13

On the other hand, acute and chronic rheumatism rickets mamma *M basedowi* pseudoleukaemia, epilepsy, acute endo and myocarditis are of lesser importance than in Holland The Indian figures for suicide show a preference for poison (mostly corrosive sublimate and firearms) those in Holland for hanging and drowning

VI Death Causes in West Java

As mentioned before not every registrar sends the certificates to the Public Health Service This circumstance applies mainly to the many small places in the Outer Possessions In Java registration is much better therefore Table V shows some figures from West Java only

In countries with an appropriate statistical bureau the mortality by different diseases can be calculated per 10 000 inhabitants Generally speaking this is impossible here, due to omissions on the part of the registrars In West Java during the last 10 years 7,661 Europeans died, the registrars sent me only 6 338 death certificates i e, a deficit of 17 per cent In 1926 I got, after some trouble 773 certificates, out of 818 deaths, i e, a deficit of 9 per cent only, accordingly the figures for this year are more accurate than those for former years

TABLE VI—*concld.*

Causes of death.	HOLLAND, 1922. POP. 7,000,000. Total.	Per 10,000 inhabitants.		WEST JAVA, 1926. 68,000 EUROPEANS. Total.	Per 10,000 inhabitants.		Ratio West Jav / Holland.
13. Pulmonary tb. ..	5,753	7·92	10·64	47	6·91	7·21	0·7
14. Tb. of the brains, etc. ..	1,038	1·43		..	..		
15. Tb. of other organs ..	934	1·29		2	0·30		
16. Cancer, etc. ..	8,133	11·20		54	8·18		0·7
17. Meningitis	541	0·74		5	0·74		1
18. Apoplexia	4,911	6·76		50	7·35		1·2
19. Heart diseases ..	6,444	8·87		33	4·88		0·5
20. Acute bronchitis ..	514	0·71		2	0·30		..
21. Chronic ,, ..	946	1·30		1	0·15		..
22. Pneumonia	3,045	4·19		35	5·14		1·2
23. Other dis. of respir. system	4,625	6·37		38	5·59		0·9
24. Dis. of the digestive system	420	0·58		5	0·74		..
25. Diarrhœa, enteritis ..	1,333	1·84		18	2·65		1·4
26. Appendicitis .	214	0·29		2	0·30		..
27. Hernia	417	0·57		7	1·03		..
28. Cirrhosis hepatis ..	268	0·37		3	0·44		..
29. Nephritis	2,369	3·26		30	4·52		1·4
30. Dis. of fem. genital system	75	0·10		2	0·30		..
31. Puerperal fever ..	126	0·17		1	0·15		..
32. Pregnancy, puerperal state	310	0·43		1	0·15		..
33. Malformations ..	1,986	2·73		14	2·06		0·7
34. Old age .. .	5,292	7·29		30	4·52		0·6
35. Accidents	1,917	2·64		24	3·53		1·3
36. Suicide	452	0·62		9	1·32		2·0
37. Other diseases ..	13,309	18·32		156	22·94		1·2
38. Ill-defined	3,654	5·03		149*	21·91		4·0
TOTAL ..	71,167	97·97		848	124·65		1·27

* The 75 death cases without certificate are here included.

TABLE V—*concld*

	Causes of death	Batavia and Mr Cornelis, 1916—1926	Bandung 1917—1926	Other places 1917—1926	Total West Java	
					Number	Per cent
31	Puerp fever	4	2	3	9	0 13
32	Other dis of pregn and puerp	35	3	16	54	0·76
33	Malformations	115	39	43	197	2 78
34	Old age	204	38	88	330	4 66
35	Accidents	113	27	38	178	2 51
36	Suicide	48	16	21	85	1 20
37	Other diseases	891	217	377	1 485	20 97
38	Ill defined	287	66	95	448	6 32
	Syphilis	61	7	19	87	1 23
	TOTAL	4 377	995	1 615	7 081	100 00

Table VI shows the figures of West Java, as compared with those of Holland

TABLE VI

Causes of death of Europeans in West Java (1926) *as compared with Holland* (1924) *per* 10,000 *inhabitants*

Causes of death	Holland 1922 Por 7 000 000		West Java 1926 68 000 Europeans		Ratio
	Total	Per 10 000 inhabitants	Total	Per 10 000 inhabitants	West Java / Holland
1 2 Typhoid fever	158	0 22	42	6 18	28
3 4 Malaria	6	0 01	28	4 12	400
5 Measles	260	0 36	1	0·15	
6 Scarlet fever	54	0·07			
7 Whooping cough	576	0 79	1	0·15	
8 Diphtheria	237	0·33	3	0·44	..
8a Dysentery	4	0·01	26	3 84	400
9 Influenza	590	0·81	9	1 32	1 6
10, 11, 12 Other inf diseases	249	0·34	20	2·94	8

APPENDIX—*contd.*

Causes of death.	N. E. I.			HOLLAND.		
	M.	F.	TOTAL.	M.	F.	TOTAL.
I. EPIDEMIC OR INFECTIOUS DISEASES—*contd.*						
8. Scarlet fever	..	..	..	30	24	54
9. Whooping-cough	6	13	19	248	328	576
10. Diphtheria	32	37	69	131	106	237
11, 12. Influenza	165	138	303	263	327	590
13. Parotitis epidemica	..	..	..	..	1	1
14. Cholera asiatica	9	7	16	..	..	..
15. „ nostras	..	..	..	3	4	7
16. Dysenteria amœbica	39	14	53	..	..	..
16*a*. „ bacillaris	51	19	70	..	1	1
16*b*. „ non-specified ..	56	38	94	3	..	3
17, 18. Plague	12	15	27	..	..	..
19. Hæmorrhagic icterus (spirochætosis) ..	..	..	..	1	2	3
19*a*. Dengue, etc.	6	10	16	..	..	..
20. Leprosy	11	11	22	2	..	2
21. Erysipelas	14	6	20	46	61	107
22. Poliomyelitis, anterior acute ..	..	1	1	15	4	19
23. Encephalitis lethargica	1	2	3	32	23	55
24. Cerebro-spinal fever	7	2	9	36	20	56
25. Other epidemic diseases	5	4	9	5	1	6
26, 27. Pyæmia and septicæmi ..	79	55	134	309	251	560
28. Anthrax	..	1	1	..	..	..
29. Lyssa	1	..	1	..	..	..
30. Tetanus	19	5	24	29	11	40
31. Mycoses	..	..	..	14	6	20
32. Pulmonary tuberculosis, etc. ..	567	327	894	2,444	2,997	5,441
33. Tb. of the meninges, etc. ..	20	13	33	557	481	1,038
34. „ „ „ bowels	15	7	22	145	247	392
35. „ „ „ vertebral column ..	..	1	1	62	60	122

VII CONCLUSIONS

(1) Due to several causes the statistical data about birth and death rate of the Europeans in the Netherlands East Indies are not as exact as in European countries

(2) The birth rate is declining, and only slightly higher than in Holland

(3) Infant mortality is also slightly higher than in Holland

(4) The crude death rate of West Java in 1926 was 12 13 per cent (Holland 1924 9 80)

(5) The standardized death rate amounted to 17 57 (Holland 1924, 10 5)

(6) This high death rate is principally caused by—

(a) Infectious intestinal diseases, typhoid fever and dysentery
(b) Malaria
(c) Enteritis in children under 2 years old
(d) Syphilis
(e) Nephritis (acute, and Bright's disease)
(f) External causes

(7) Most of the 'tropical diseases cholera dengue beri beri, tropical sprue are of lesser importance

(8) Bronchitis, measles scarlet fever and whooping cough are not of such importance as in Holland

(9) Consequently the means to an appreciable reduction of the death rate will be general sanitation anti malarial and anti faecal

REFERENCE

(1) ROSENAU M J (19[illegible]7) Preventive Medicine and Hygiene [illegible]

APPENDIX

Causes of death of Europeans in the Netherlands East Indies (1919—192[illegible]) *compared with Holland* (1921)

Causes of death	N E I			Holland		
	M	F	TOTAL	M	F	TOTAL
I EPIDEMIC OR INFECTIOUS DISEASES						
1—4 Febris typhoidea	298	13[illegible]	4[illegible]0	88	[illegible]0	1[illegible]
5 Malaria	31[illegible]	[illegible]1[illegible]	[illegible]30	4	2	[illegible]
5a Blackwater fever	[illegible]5	1[illegible]	4[illegible]			
6 Smallpox	21	1[illegible]	38			
7 Measles	8	11	1[illegible]	145	115	[illegible]

APPENDIX—*contd.*

Causes of death.	N. E. I.			Holland.		
	M.	F.	Total.	M.	F.	Total.
II. General Diseases—*concld.*						
58. Pernicious anæmia	12	10	22	146	197	343
58*a*. Other kinds of anæmia; chlorosis ..	9	12	21	35	49	84
58*b*. Aphthæ tropicæ	32	6	38	..	..	..
59. Dis. of the glandula pituitaria ..	..	..	..	4	..	4
60. Morbus basedowi	..	1	1	6	46	52
60*a* 62. Other dis. of the thyroid gland..	..	1	1	31	21	52
63. Morbus addisoni	..	..	..	5	12	17
64. Diseases of the spleen	1	..	1	2	1	3
65. Leukæmia	7	6	13	60	43	103
65*a*. Pseudoleukæmia, etc.	..	1	1	45	36	81
66. Acute chronic alcoholism ..	13	2	15	18	..	18
67, 68. Chronic poisoning	5	1	6	1	..	1
69. Other general diseases	4	6	10	25	28	53
III. Diseases of the Nervous System and the Organs of Special Sense.						
70. Encephalitis, brain abscess ..	31	21	52	193	178	371
71. Acute meningitis	56	19	75	318	223	541
72. Tabes dorsalis	18	1	19	77	37	114
73. Other diseases of the spinal cord ..	13	1	14	189	164	353
74. Cerebral hæmorrhage, apoplexy ..	287	130	417	1,963	2,655	4,618
74*a*. Embolus or thrombus in the brains	7	2	9	68	65	133
75. Hemiplegy without specified cause ..	6	..	6	12	12	24
75*a*. Other forms of paralysis ..	5	3	8	1	4	5
76. General paralysis	46	1	47	141	42	183
77. All other psychoses	5	5	10	21	34	55
78. Epilepsia	8	3	11	97	94	191
79. Eclampsy	1	6	7	8	13	21
80. Convulsions of inf. under 5 years ..	117	99	216	661	511	1,175

APPENDIX—*contd.*

Causes of death.	N. E. I.			HOLLAND.		
	M.	F.	TOTAL.	M.	F.	TOTAL.
I EPIDEMIC OR INFECTIOUS DISEASES—*concld*						
36 Tb of the joints	..	..	.	21	21	42
37. „ „ „ skin	..	..		7	12	19
37*a* „ „ „ bones		.	..	23	30	53
37*b* „ „ „ lymphatic vessels ..	.	.	.	14	15	29
37*c* „ „ „ genito urinary system ..	2	1	3	77	57	134
37*d*. „ „ „ other organs	1	2	3	68	75	143
38 Acute miliar tuberculosis ..	5	7	12	132	152	284
38*a* Chronic disseminated tuberculosis ..	1	1	2	16	12	28
39 Syphilis	108	38	146	91	72	163
39*a* Frambœsia	1		1	..	.	..
40. Ulcus molle	1	.	1		.	..
41, 42. Gonorrhoic affections	.	1	1	2	1	3
II. GENERAL DISEASES.						
43. Cancer, etc , of the buccal cavity, etc.	32	15	47	129	51	180
44. „ „ „ „ *stomach, etc.* ..	139	41	180	2,502	1,964	4,466
45. „ „ „ „ peritoneum, etc ..	38	30	68	524	646	1,170
46. „ „ „ „ female genital organs	..	100	100	..	617	617
47. „ „ „ „ breast.. ..	..	50	50	7	335	342
48. „ „ „ „ skin	..	1	1	67	58	125
49. „ „ „ „ other organs, etc ..	86	41	127	664	369	1,033
50. Other tumours..	18	12	30	71	62	133
51. Acute articular rheumatism ..	4	3	7	54	55	109
52. Chronic rheumatism and gout ..	4	1	5	34	110	144
53. Scurvy	1	5	6	12	14	26
54. Pellagra	..	..	..	1	..	1
55. Beri beri	22	4	26	..	..	..
56. Rachitis	3	2	5	41	30	71
57. Diabetes mellitus	90	104	194	390	642	1,032

APPENDIX—*contd.*

Causes of death.	N. E. I.			HOLLAND.		
	M.	F.	TOTAL.	M.	F.	TOTAL.
V. DISEASES OF THE RESPIRATORY SYSTEM—*concld.*						
101. Affections of the pleural cavity ..	17	4	21	112	89	201
102. Congestion, etc., of the lungs ..	6	2	8	69	68	137
103. Pulmonary gangrene	2	..	2	41	8	49
104. Asthma bronchiale	15	5	20	62	45	107
105. Emphysema pulmonum	4	..	4	230	110	340
106. Chronic pneumonia interstitialis ..	1	..	1	1	1	2
106*a*. Diseases of the mediastinum ..	1	..	1	3	2	5
106*b*. Other diseases of the resp. system ..	26	11	37	87	62	149
VI. DISEASES OF THE DIGESTIVE SYSTEM.						
107. Diseases of the buccal cavity ..	..	3	3	6	9	15
108. Angina, etc.	11	8	19	38	20	58
109. Diseases of the œsophagus ..	..	..	..	5	3	8
110. Ulcer of the stomach	21	5	26	144	63	207
110*a*. Duodenal ulcer	3	1	4	31	17	48
111. Other diseases of the stomach ..	26	15	41	108	57	165
112. Diarrhœa, etc. (children under 2 years)	228	148	376	747	586	1,333
113. ,, ,, (children over 2 years)	83	45	128	117	149	266
114, 115. Ankylostomiasis, etc. ..	..	1	1	3	..	3
116. Appendicitis and typhlitis ..	34	18	52	147	67	214
117. Hernia	47	23	70	48	77	125
117*a*. Intestinal obstruction	..	..	..	136	156	292
118. Other affect. of the intest. canal ..	14	4	18	32	25	57
119. Icterus gravis	12	8	20	28	33	61
120. Hydatides of the liver	..	..	..	3	2	5
120*a*. Abscess of the liver	37	8	45	..	..	..
121. Cirrhosis of the liver	61	17	78	146	122	268
122. Gallstones	16	8	24	39	94	133

APPENDIX—*contd.*

Causes of death.	N. E. I.			Holland.		
	M	F.	Total.	M.	F.	Total.
III. Diseases of the Nervous System and the Organs of Special Sense—*concld*						
81 Chorea, hysteria, neuralgia, etc. ..	5	1	6	11	9	20
82. Softening of the brain .. .	1	.	1	78	82	160
83. Other dis. of the nervous system ..	17	13	30	173	142	315
84. Affections of the eye	.	1	1	2	1	3
85. Diseases of the ears, etc . ..	2	3	5	39	23	62
IV. Diseases of the Circulatory System.						
86 Pericarditis	4	.	4	16	15	31
87. Acute endocarditis; myocarditis ..	17	9	26	434	521	955
88 Angina pectoris	32	8	40	247	129	376
89 Organic diseases of the heart ..	363	198	561	2,907	3,537	6,444
90 Aneurysma	.	.	.	58	27	85
91. Other dis. of the arteries ..	124	38	162	780	596	1,376
92 Embolus and thrombus	9	12	21	77	124	201
93. Diseases of the veins	2	1	3	4	12	16
94. Dis of the lymphatic system ..	..	..	..	5	2	7
95. Hæmorrhages, etc.	22	12	34	25	20	45
V. Diseases of the Respiratory System.						
96. Diseases of the nasal cavity ..	1	1	2	2	1	3
97 " " " larynx	2	2	4	35	19	54
98. Bronchitis, acute	31	24	55	149	144	293
98a. " chronic	19	9	28	395	312	707
98b. Br. not specif. (5 years and younger)..	..	..	..	122	98	220
98c. " " " (older than 5 years) ..	..	..	..	108	131	239
99. Broncho pneumonia	251	207	458	1,911	1,667	3,578
100. Lobar pneumonia	175	110	285	779	555	1,334
100a. Pneumonia, not specified ..	87	65	152	913	795	1,708

APPENDIX—*contd.*

Causes of death.	N. E. I.			HOLLAND.		
	M.	F.	TOTAL.	M.	F.	TOTAL.
VIII. THE PUERPERAL STATE—*concld.*						
148. Puerperal albuminuria and eclampsia	..	21	21	..	73	73
149. Other consequences of childbirth ..	..	5	5	..	4	4
150. Puerperal affections of the breast ..	..	..	..	..	2	2
IX. AFFECTIONS OF THE SKIN AND OF THE CELLULAR TISSUE.						
151. Gangrene	6	5	11	71	73	144
152. Furunculosis	5	2	7	18	10	28
153, 154. Phlegmon ; hot abscess ..	15	9	24	32	21	53
155. Other diseases of the skin, etc. ..	2	2	4	32	34	66
X. AFFECTIONS OF THE BONES AND THE ORGANS OF LOCOMOTION.						
156 58. Affections of the bones, joints, etc.	4	..	4	49	34	83
XI. CONGENITAL ANOMALIES.						
159. Congenital anomalies	32	37	69	300	240	540
XII. EARLY INFANCY.						
160. Congenital debility	154	127	281	718	503	1,221
161. Premature birth, etc.	54	34	88	299	235	534
162. Other diseases of early infancy ..	21	18	39	66	40	106
163. Neglect, bad nursing of infants ...	5	4	9	6	4	10
XIII. OLD AGE.						
164. Old age	246	293	539	2,313	2,979	5,292
XIV. DEATH FROM EXTERNAL CAUSES.						
165. Suicide by poison	36	32	68	7	14	21
166. ,, ,, corrosive substances ..	1	..	1	..	..	..
167. ,, ,, poisonous gas.. ..	6	..	6	11	7	18
168. ,, ,, hanging, etc.	16	1	17	230	49	279
169. ,, ,, drowning	7	1	8	32	41	73

APPENDIX—*contd.*

Causes of death	N. E. I.			HOLLAND		
	M.	F.	TOTAL	M.	F.	TOTAL
VI. DISEASES OF THE DIGESTIVE SYSTEM—*concld.*						
123 Other affections of the liver, etc.	16	12	28	30	72	102
124 Diseases of the pancreas	1	1	2	26	44	70
125 Peritonitis	51	33	87	205	215	420
126 Other aff. of the digest. system	4	2	6	5	9	14
VII. NON-VENEREAL *DISEASES OF* THE GENITO-URINARY SYSTEM						
127 Acute and subacute nephritis	35	20	55	90	70	160
128 Diseases of Bright, etc.	277	171	398	964	1 245	2 209
129 Chyluria				4	1	5
130 Other diseases of the kidneys, etc.	16	14	30	100	85	185
131 Stones in the urinary passages	8	1	9	17	18	35
132 Diseases of the bladder	3	6	9	53	34	87
133 Affections of the urethra	6		6	6		6
134 Affections of the prostate	10		10	318		318
135 Other non-venereal d. of the genit.	1		1	1		1
136 Cysts, etc., of the ovarium		2	2		21	21
137 Salpingitis or pelvic abscess		4	4		12	12
138 Tumours of the uterus exc. cancer		8	8		34	34
139 Non-puerp. hemorrh. from the uterus		3	3		1	1
140—142 Metritis, etc.					7	7
VIII. THE PUERPERAL STATE						
143 Abortus		7	7		22	22
143a Extra-uterine pregnancy		5	5		8	8
143b Other causes of abnormal pregnancy		31	31		10	10
144 Hæmorrhage during or after birth		35	35		103	103
145 Other deaths by childbirth		16	16		28	28
146 Febris puerperalis		23	23		126	126
147 Phlegmasia alba dolens, etc.		5	5		60	60

APPENDIX—*concld.*

Causes of death.	N. E. I.			HOLLAND.		
	M.	F.	TOTAL.	M.	F.	TOTAL.
XIV. DEATH FROM EXTERNAL CAUSES—*concld.*						
202. Other external violence	30	6	36	21	9	30
203. Death by violence not specified ..	6	1	7	1	1	2
XV. CAUSES OF DEATH ILL-DEFINED OR UNKNOWN.						
204. Sudden death	44	23	67	217	184	401
205. Hydrops., etc.	76	62	138	10	14	24
206. Unknown	349	232	581	1,479	1,332	2,811
206*a*. Pædatrophia in children over three months old.	5	9	14	109	68	177
TOTAL ..	6,707	4,437	11,144	34,609	34,748	69,357

APPENDIX—*contd*

Causes of death	N E I			Holland		
	M	F	Total	M	F	Total
XIV Death from External Causes—*contd*						
170 Suicide by firearms	41		41	32	3	35
171 ,, cutting instruments	6	1	7	12		12
172 ,, falling	2		2	1	4	5
173 ,, crushing	2	2	4	8	1	9
174 ,, other means	8	3	11			
175, 176 Poisoning by food	2		2	2		2
177 Other acute poisonings	23	6	29	6	3	9
178 Burning by fire	5	4	9	9	5	14
179 ,, *otherwise*	11	7	18	89	110	199
180 Accidental suffocation (mechanical)	3		3	22	3	25
181 Suffocation by poisonous gases etc	3	2	5	30	23	53
182 Drowning (except suicide)	51	10	61	538	166	694
183 Death by firearms	14		14	18	4	22
184 ,, ,, cutting instruments	16	1	17	10		10
185 ,, ,, fall	15	2	17	210	82	292
186 D b Mine labour or quarries	2		2	23		23
187 Death by machinery .	2		2	17	1	18
188 ,, ,, crushing	40	8	48	331	95	426
189—191 Death caused by animals, etc	1	.	1	14	2	16
192 Exhaustion, starvation, etc	14	2	16	15	13	28
193 Frost	..		..	3	2	5
194 Sunstroke, hyperthermia .	2	.	2	1		1
195 Lightning .	.	.		8	3	11
196 Other electric discharge .	6	1	7	9	1	10
197 Murder by firearms	2	1	3	1	1	2
198 ,, ,, cutting instruments	5	2	7	7	2	9
199, 200 ,, other means	5	1	6	6	2	8
201 Fracture (not specified) ..	45	6	51	5	2	7

APPENDIX—*concld.*

Causes of death.	N. E. I.			HOLLAND.		
	M.	F.	TOTAL.	M.	F.	TOTAL.
XIV. DEATH FROM EXTERNAL CAUSES—*concld.*						
202. Other external violence	30	6	36	21	9	30
203. Death by violence not specified ..	6	1	7	1	1	2
XV. CAUSES OF DEATH ILL-DEFINED OR UNKNOWN.						
204. Sudden death	44	23	67	217	184	401
205. Hydrops., etc.	76	62	138	10	14	24
206. Unknown	349	232	581	1,479	1,332	2,811
206*a*. Pædatrophia in children over three months old.	5	9	14	109	68	177
TOTAL ..	6,707	4,437	11,144	34,609	34,748	69,357

INCIDENCE OF PULMONARY [illegible] ACCORDING TO SEX, [illegible] RESIDENCE IN DIFFERENT [illegible]

BY

GIAN SINGH, [illegible]

Municipal Medical Officer [illegible]

Sex and [illegible]

An analysis of deaths from pulmonary [illegible] the Punjab, with a population of [illegible] average death rate from this disease [illegible]

(*a*) For the whole town—[illegible] per thousand [illegible]

(*b*) For Hindu males—[illegible] per thousand.

(*c*) For Hindu females—[illegible] per thousand.

(*d*) For Mohammedan males—[illegible] per thousand.

(*e*) For Mohammedan females—[illegible] per thousand.

The population of the town is composed [illegible] Hindus Sikhs, Europeans and Parsis are [illegible] point of view.

TABLE I.

Deaths from pulmonary tuberculosis in [illegible] ten years [illegible]

Sex and religion.	Total deaths [illegible] years.	[illegible]	[illegible]	[illegible]
Whole population	[illegible]	[illegible]	[illegible]	[illegible]
Hindu males	[illegible]	[illegible]	[illegible]	[illegible]
Hindu females	[illegible]	[illegible]	[illegible]	[illegible]
Mohammedan males	[illegible]	[illegible]	[illegible]	[illegible]
Mohammedan females	[illegible]	[illegible]	[illegible]	[illegible]
Sikh males and females	5	[illegible]	[illegible]	[illegible]
Other males and females	7	[illegible]	[illegible]	[illegible]

TABLE II.

Showing percentage of deaths from pulmonary tuberculosis in various age groups.

Age groups.	MALES.				FEMALES.				REMARKS.
	HINDUS.		MOHAMMEDANS.		HINDUS.		MOHAMMEDANS.		
	No. of deaths.	Percentage of total deaths.	No. of deaths.	Percentage of total deaths.	No. of deaths.	Percentage of total deaths.	No. of deaths.	Percentage of total deaths.	
0– 4 ..	9	4·18	19	5·35	19	4·39	23	3·41	0–4 means age up to 4 years.
5– 9 ..	13	6·80	18	5·07	29	6·71	21	3·12	5–9 means age more than 4 years and up to 9 years, and so on.
10–14 ..	18	8·36	15	4·22	53	12·26	95	14·13	
15–19 ..	25	13·09	40	11·26	97	22·45	111	16·49	
20–24 ..	29	15·18	52	14·64	93	21·53	105	15·60	
25–29 ..	30	15·70	41	11·54	66	15·27	93	13·81	
30–34 ..	32	11·51	49	13·80	31	7·17	68	10·10	
35–39 ..	16	8·37	30	8·45	18	4·18	50	7·42	
40–44 ..	14	7·12	29	8·17	13	3·00	47	6·38	
45–49 ..	9	4·18	20	5·63	4	·92	17	2·52	
50–54 ..	2	1·04	22	6·19	4	·92	25	3·71	
55–59 ..	1	·52	4	1·12	1	·23	3	0·44	
60–64 ..	2	1·04	8	2·24	3	·69	10	1·48	
65–69 ..	1	·52	6	1·68	1	·23	7	1·04	
70–80 ..	..	..	2	·56	..	..	2	·29	

INCIDENCE OF PULMONARY TUBERCULOSIS IN MULTAN CITY, ACCORDING TO SEX, RELIGION, AGE, OCCUPATION AND RESIDENCE IN DIFFERENT AREAS OF THE CITY

BY

GIAN SINGH, M B, B S, D P H

Municipal Medical Officer of Health, Multan

SEX AND RELIGION

AN analysis of deaths from pulmonary tuberculosis in Multan a town in the Punjab, with a population of 90,000, for a period of 10 years shows that the average death rate from this disease is–

(*a*) For the whole town—1 87 per thousand of the whole population

(*b*) For Hindu males—1 05 per thousand

(*c*) For Hindu females—2 81 per thousand

(*d*) For Mohammedan males—1 20 per thousand

(*e*) For Mohammedan females—2 77 per thousand.

The population of the town is composed almost wholly of Mohammedans and Hindus Sikhs, Europeans and Parsis are quite negligible from the statistical point of view

TABLE I

Deaths from pulmonary tuberculosis in Multan according to sex and religion for ten years 1917 to 1926

Sex and religion	Total deaths for 10 years	Average of one year	Population according to census of 1921	Death rate per thousand
Whole population	1 666	166 6	89 162	1 87
Hindu males	191	19 1	18 095	1 05
Hindu females	432	43 2	15,370	2 81
Mohammedan males	355	35 5	29,504	1 20
Mohammedan females	673	67 3	24,[illegible]	2 77
Sikh males and females	8	8	1,201	
Other males and females	7	7	607	

TABLE III—*concld.*

Occupations.	HINDUS.				MOHAMMEDANS.			
	MALES.		FEMALES.		MALES.		FEMALES.	
	No. of deaths.	Percentage of total deaths.	No. of deaths.	Percentage of total deaths.	No. of deaths.	Percentage of total deaths.	No. of deaths.	Percentage of total deaths.
Agriculturists ..	8	4·19	11	2·54	14	3·94	28	4·16
Beggars	6	3·14	2	·46	9	2·53	3	·46
Weavers	1	·52	1	·23	55	15·4	99	11·70
Vehicle drivers ..	1	·52	2	·46	9	2·53	9	1·38
Goldsmiths ..	3	1·52	12	2·76	7	1·97	12	1·84
Medical men ..	5	2·64	3	·69	2	·56	7	1·04
Tailors	2	1·04	..	..	25	7·04	27	4·14
Washermen ..	1	·52	..	..	..	..	5	0·74
Confectioners ..	3	1·52	..	..	..	..	..	..
Soap-makers ..	1	·52	1	·23	..	..	..	..
Contractors ..	..	..	6	1·38	2	·56	19	2·80
Skilled labourers ..	..	..	1	·23	8	2·24	12	1·84
Pleaders	..	..	1	·23	..	..	..	..
Carpenters ..	..	..	..	..	31	8·73	50	7·43
Professional singers ..	..	..	..	..	6	1·69	10	1·48
Millers	..	..	2	·46	2	·56	2	·31
Blacksmiths ..	..	..	..	..	11	3·08	18	2·76
Butchers	..	..	..	..	3	·84	11	1·63
Barbers	..	..	..	..	11	3·08	14	2·08
Fire-works makers ..	..	..	..	..	1	·28	..	..
Tinsmiths ..	..	..	..	..	2	·56	1	·16
Tanners	..	..	..	..	1	·28	1	·16
Brass smiths ..	..	..	..	..	2	·56	6	·92
Oil distillers ..	..	..	..	..	1	·28	1	·16
Pottery makers ..	..	..	..	..	3	·84	5	·74
Dyers	..	..	..	..	1	·28	..	..
Shoe-makers ..	..	..	..	..	35	9·85	52	7·72
Bakers	..	..	..	..	..	..	4	·62

N.B.—In case of females, the profession of their husbands or fathers has been noted.

3 Females show the maximum mortality from the disease between the ages of 10 and 30 years, while in the males maximum mortality is postponed by five years at both the ends Most of the victims of the disease are young persons

4 Up to 30 years of age Hindu females die from the disease proportionately more than Mohammedan females, but after 30 years of age the reverse is the case A similar observation holds good for Hindu and Mohammedan males It appears that *Hindus by living in ill ventilated and dark houses in the central portion of the city* acquire infection of tuberculosis at an earlier age than the Mohammedans, most of whom live away from the centre of the city in the area where they can afford to have court yards in their houses Child marriages are not so common among Mohammedans as among Hindus and moreover the diet of Mohammedans generally is more nutritious than the diet of the Hindus

5 After 45 years the mortality from the disease falls abruptly but more so in females than in males

6 Mohammedan females and males die more from tuberculosis after the age *of 45 years than Hindu males and females Mohammedans show a better* resistance to the disease on account of their houses being more open to sunshine than the houses of Hindus, and their spending more money on their personal comforts and food than the thrifty Hindus Certain occupations carried on exclusively by Mohammedans may be the cause of this late infection in them

Occupation

Among Hindu males 46 07 per cent of deaths from the disease are contributed by shopkeepers and 20 91 by men in service of Government or private bodies *Similarly females of Hindu shopkeepers and Hindu servants show the highest* mortality, the percentage in them being 57 49 and 22 22 Hindu male labourers and their wives come third on the list with a percentage of 7 33 and 6 71 respectively, the fourth in number being Hindu priests and their females (6 80 and 3 70 per cent)

Table III

Showing deaths from pulmonary tuberculosis according to occupations

Occupations	Hindus				Mohammedans			
	Males		Females		Males		Females	
	No of deaths	Percentage of total deaths	No of deaths	Percentage of total deaths	No of deaths	Percentage of total deaths	No of deaths	Percentage of total deaths
Shopkeepers	88	46·07	248	57 49	39	10 98	104	15 45
Servants Government or in private firms	40	20 91	96	22 22	42	11 83	97	14 41
Priests	13	6 80	16	3 70	6	1 69	17	2 52
Labourers	14	7 33	29	6 71	26	7 36	59	8 76

N B —In case of females, the profession of their husbands or fathers has been noted.

the wall and the road surrounding it. Forty-three per cent of the population is inside this wall and 57 per cent outside it; but during the years 1917 to 1926, 53 per cent of the deaths from pulmonary tuberculosis have occurred in the inner portion of the city and 47 per cent in the outer portion, in spite of the fact that the population in the outer portion consists of people poor in circumstances and most of the Mohammedan weavers, shoe-makers, carpenters, labourers and tailors reside in this area.

CONCLUSIONS.

Having analysed the main causes, it may be expected to suggest some general remedies.

1. To decrease mortality from tuberculosis in cities like Multan, in addition to the well-recognized anti-tuberculosis measures, the local Government should press the municipalities—

(*a*) to take housing schemes in hand,

(*b*) to open up the congested sites, and

(*c*) to enforce the building by-laws prohibiting the erection of high houses in narrow lanes.

It cannot be expected that the local bodies will take these schemes in hand themselves. The public has begun to realize the value of open air but can find no means of getting it. Many well-to-do persons, who can afford to have good houses outside the cities, are afraid to build them there, for they think life and property are not safe there, and spend more money on ill-ventilated houses in narrow lanes.

2. Municipalities should employ lady health visitors to carry on propaganda amongst women against certain customs observed by them during their puerperal periods.

3. Anti-purdah and anti-child-marriage societies should be formed. Much has been accomplished during the last decade and the conditions are much better now, but still to accelerate the pace of progress these societies are necessary.

4. Government and local bodies should improve the economic conditions of their low-paid servants. Government is the biggest employer of labour in this country. On account of unemployment among the middle class people, cheap clerks are always available in the market in abundance, but they and their families' famished looks always betray the fact that they are only managing to keep body and soul together by their emoluments. They lack the constitution necessary to ward off diseases like tuberculosis.

5. Propaganda should be carried on among shopkeepers against (*a*) adopting the squatting position in their shops and (*b*) keeping their shops open for 365 days in the year from morning till sunset.

The adoption of all these suggestions may appear difficult, but if any campaign worth the name is to be carried on against this mysterious but deadly disease, they cannot be overlooked.

Among Mohammedan males the order of occupations showing a downward grade of mortality from the disease is as given below —

Weavers	15 40	per cent
Servants (Government and private)	11 83	,,
Shopkeepers	10 98	,,
Shoe makers	9 85	,,
Carpenters	8 73	,,
Labourers	7 33	,,
Tailors	7 04	,,
Agriculturists	3 94	,,

Their females show practically the same order —

Females of	Shopkeepers	15 45	per cent
,,	Weavers	14 70	,,
,,	Servants	14 40	,,
	Labourers	8 76	,,
	Shoe makers	7 72	,,
	Carpenters	7 43	,,
	Agriculturists	4 16	,,
,	Tailors	4 14	,,

Thus —

1 Shopkeepers of both the communities show a high mortality from the disease Their sedentary habits desire to hoard money and unwillingness to spend any money more than is absolutely necessary for the purchase of nutritious articles of food predispose them to the disease Then many shops are located in narrow streets with no free access to air and sunshine

2 Among both the communities males whose means of subsistence is service, Government or private show a high rate of mortality They work in overcrowded offices have no opportunity to take exercise in the open air and are mostly low paid Having received education in schools they and their families have to maintain a respectable exterior This they do at the expense of good nutritious food and good residential houses With all these influences at work, it is but natural that they should fall an easy prey to the ravages of this fell disease

3 The professions of weaving shoe making carpentry and tailoring are harmful for the lungs These are sedentary occupations, are carried on in over crowded rooms and possibly minute particles of cotton leather and wood are inhaled and injure the lungs

4 Occupations of the males of both the communities react upon their females as far as tuberculosis is concerned

Residence in different parts of the city

The city of Multan can be conveniently divided into two portions The old town is situated within a wall running around the city and the new town outside

Appendix II.

Deaths from pulmonary tuberculosis among Hindus in Multan according to age.

A. Males.

Years.	Age Groups.													
	0—4	5—9	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50—54	55—59	60—64	65—70
1917 ..	1	5	7	3	1	3	3	3	1	1	0	0	0	1
1918 ..	0	1	2	1	4	4	4	2	2	2	0	0	0	0
1919 ..	4	3	3	4	7	3	6	1	1	2	0	0	0	0
1920 ..	1	0	2	5	2	2	5	4	2	1	0	0	0	0
1921 ..	..	3	1	3	4	2	1	1	5	2	1	0	0	0
1922 ..	2	1	..	1	3	6	1	3	0	0	1	0	0	0
1923 ..	..	..	1	3	3	3	2	0	1	0	0	0	0	0
1924 ..	1	..	1	3	2	1	0	1	2	0	0	0	0	0
1925 ..	..	..	..	1	1	3	0	1	0	0	0	1	1	0
1926 ..	..	..	1	1	2	3	0	0	0	1	0	0	1	0
Total ..	9	13	18	25	29	30	22	16	14	9	2	1	2	1
Percentage ..	4·181	6·80	8·36	13·09	15·18	15·70	11·51	8·37	7·12	4·18	1·04	·52	1·04	·52

APPENDIX I

Deaths from pulmonary tuberculosis in Multan according to sex and religion

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	Total deaths for 10 years	Average of one year	Population according to the census of 1921	Death rate per 1 000
Hindu males	29	22	34	24	23	16	13	11	8	9	191	19 1	18 095	1 05
Hindu females	50	49	45	44	47	52	38	39	42	26	432	43 2	15 370	2 81
Mohammedan males	32	41	40	44	45	46	23	19	32	33	355	35 5	29 504	1 20
Mohammedan females	68	55	86	84	90	88	45	45	60	52	673	67 3	24 285	2 77
Sikh males		1									1	1	724	
Sikh females	1		1	1		1		1	2		7	7	577	
Other males	1										6	6	312	
Other females	1	1		1		1			1	1	1	1	295	
TOTAL	182	169	206	198	205	206	119	115	145	121	1 666	166 6	89 162	1 87

APPENDIX III.

Deaths from pulmonary tuberculosis among Mohammedans in Multan city according to age.

A. Males.

Years.	AGE GROUPS.														
	0—4	5—9	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50—54	55—59	60—64	65—69	70—80
1917 ..	3	1	1	2	4	4	3	1	0	5	5	0	2	1	0
1918 ..	2	1	1	9	4	8	7	5	1	1	1	0	0	1	0
1919 ..	2	2	2	4	8	3	5	4	4	1	1	1	2	1	0
1920 ..	3	2	5	2	6	3	9	3	6	3	2	0	0	0	0
1921 ..	4	6	2	4	5	2	4	5	6	2	4	0	0	0	1
1922 ..	1	3	2	5	7	4	5	5	6	2	4	1	1	0	0
1923 ..	1	2	0	3	7	2	2	2	0	2	1	0	0	1	0
1924 ..	0	1	0	3	3	4	3	1	3	0	0	0	0	1	0
1925 ..	3	0	0	1	6	4	6	3	0	2	3	1	2	1	0
1926 ..	0	0	2	7	2	7	5	1	3	2	1	1	1	0	1
TOTAL ..	19	18	15	40	52	41	49	30	29	20	22	4	8	6	2
Percentage	5·35	5·07	4·22	11·26	14·64	11·54	13·80	8·45	8·17	5·63	6·19	1·12	2·24	1·68	·56

APPENDIX II—*concld*

Deaths from pulmonary tuberculosis among Hindus in Multan according to age.

B Females.

Years	Age Groups													
	0—4	5—9	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50—54	55—59	60—64	65—70
1917 ..	4	7	4	8	13	8	0	3	0	1	1	0	1	0
1918 ..	4	1	5	10	10	3	6	3	5	1	0	0	1	0
1919 ..	1	3	7	9	11	9	3	2	0	0	0	0	0	0
1920 ..	2	1	5	9	11	5	4	4	2	0	1	0	0	0
1921 ..	3	3	6	13	9	6	3	3	1	0	0	0	0	0
1922 ..	2	4	2	13	9	12	5	1	1	2	1	0	0	0
1923 ..	0	3	7	6	10	7	1	1	1	0	1	1	0	0
1924 ..	2	1	7	13	9	3	1	1	1	0	0	0	0	1
1925 ..	0	6	4	9	5	10	6	0	1	0	0	0	1	0
1926 ..	1	0	6	7	6	3	2	0	1	0	0	0	0	0
TOTAL ..	19	29	53	97	93	66	31	18	13	4	4	1	3	1
Percentage ..	4 39	6 71	12 26	22 45	21 53	15 27	7 17	4 18	3 0	·92	92	23	69	23

APPENDIX IV A.

Occupations of Hindu males who have died from pulmonary tuberculosis during the years 1917 *to* 1926 *in Multan town.*

Occupation.	Years.										Total.
	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	
Shopkeepers ..	13	11	12	13	12	10	5	6	3	3	88
Servants (Government or in private firms)	5	5	9	4	3	4	5	2	2	1	40
Beggars ..	..	1	1	1	1	1	1	..	..	..	6
Priests	3	2	2	1	3	1	..	..	..	1	13
Labourers ..	3	..	4	2	2	1	1	1	..	..	14
Agriculturists ..	1	..	3	1	..	..	..	2	..	1	8
Goldsmiths ..	..	1	..	..	..	1	..	1	..	..	3
Medical men ..	1	1	..	1	..	1	..	..	1	..	5
Tailors	1	..	..	..	1	..	..	..	..	..	2
Washermen ..	..	..	..	..	1	..	..	..	..	..	1
Confectioners ..	..	..	..	..	..	..	..	..	1	2	3
Soap-makers ..	..	..	..	..	..	..	..	..	..	1	1
Weavers ..	..	1	..	..	..	..	..	..	..	..	1
Vehicle drivers ..	..	..	1	..	..	..	..	..	..	..	1
Profession not known	2	..	2	1	..	..	..	..	..	..	5

APPENDIX III—*concld*

Deaths from pulmonary tuberculosis among Mohammedans in Multan city according to age

B. Females.

Years	Age Groups														
	0—4	5—9	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50—54	55—59	60—64	65—69	70—80
1917 ..	3	1	9	17	10	1	6	3	3	0	5	0	1	0	0
1918 ..	0	2	8	8	8	5	8	10	3	2	1	0	0	0	0
1919 ..	5	3	12	14	12	14	5	8	8	1	2	1	1	0	0
1920 ..	13	3	9	7	15	9	15	7	8	1	3	0	0	4	0
1921 ..	4	5	9	12	15	18	12	5	3	2	3	1	0	0	1
1922 ..	5	0	16	16	11	9	8	7	6	5	3	0	1	0	1
1923 ..	1	1	9	10	7	4	3	2	5	1	1	0	1	0	0
1924 ..	2	0	7	4	11	6	4	2	2	3	1	0	1	2	0
1925 ..	0	4	5	14	13	9	2	4	1	1	3	1	3	0	0
1926 ..	0	2	11	9	3	8	6	2	0	1	3	0	2	1	0
TOTAL ..	23	21	95	111	105	83	68	50	39	17	25	3	10	7	2
Percentage	3·41	3·12	14·13	16·49	15·60	13·81	10·10	7·42	6·38	2·52	3·71	·44	1·48	1·04	·29

Appendix IV B

Occupations of husbands and fathers of Hindu females who have died of pulmonary tuberculosis during the years 1917 to 1926 in Multan town

Occupation	Years										Total
	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	
Shopkeepers	24	32	32	19	32	29	18	25	25	12	248
Servants (Government or in private firms)	11	10	7	13	11	11	7	8	6	9	93
Beggars		1		1							2
Priests	2	1	2	2	1	3	2	1	1	1	16
Labourers	5	3	3	8		1	3	1	5		29
Agriculturists				1		2	3	2	2	1	11
Goldsmiths	4	2				1	2	1	1	1	12
Medical men	1						1		1		3
Tailors											
Washermen											
Confectioners											
Soap makers					1						1
Weavers						1					1
Vehicle drivers					1				1		2
Profession not known	1										1
Skilled labourers			1								1
Flour millers	1							1			2
Dealers								1			1
Contractors	1				1	2	1			1	6

EXPERIMENTAL STUDIES ON THE PATHWAY OF INVASION OF VARIOLA-VIRUS.

BY

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ALTHOUGH vaccination is rather thoroughly performed throughout the world, the epidemics of smallpox still take place even in the most civilized countries, reminding us that it is seriously important to study the pathway of invasion of the virus into the body.

Though the literature on this subject is so extensive, it may be almost certainly said that no experiment has been carried out to ascertain the entrance-path exactly. This may be ascribed chiefly to the fact that we have had no precise method for the demonstration of variola- or vaccinia-virus until recent years.

At the previous sixth meeting of the Association, I reported a very effective method initiated by me for this purpose, and at the same time I made the first demonstration by my method of the constant presence of variola-virus in urine and blood of the patients.

My work, therefore, has made clear for one thing that the urine of the patients is a source of infection and is liable to serve as a medium to spread the variola-virus. In addition, using the blood of the patients, my method serves to confirm the diagnosis of variola in suspected cases.

In short, the presence of the virus in the blood of the patients is demonstrated as follows: —

One c.c. of blood, prevented from coagulation by adding a small amount of citrate of soda in the usual manner, is inoculated into the testicle of rabbits. Castration is performed a week after the inoculation, and the typical changes in the tissue brought out by the virus are found in microscopical examination, and the presence of the virus is demonstrated if the specific histopathological lesions are observed.

The present study is also conducted by the same method.

PRINCIPLES OF MY METHOD.

My method is chiefly based upon the utilization of the biological properties of variola- or vaccinia-virus toward the testicles of the susceptible animals.

Appendix IV D

Occupations of husbands and fathers of Mohammedan females who have died of pulmonary tuberculosis during the years 1917 *to* 1926 *in Multan town*

Occupation	Years										Total
	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	
Shoemakers	5	3	4	7	8	9	4	3	2	7	52
Shopkeepers	18	6	7	8	11	18	11	9	13	3	104
Servants (Government or in private firms)	7	11	16	10	11	11	7	7	12	5	97
Beggars						1	2				3
Priests	2	2	3	1	3	2	2	1		1	17
Carpenters		3	8	12	14	7	2	1	3		50
Labourers	5	9	10	9	6	7		5	5	3	59
Agriculturists	2	1	4	3	2	4	3		3	6	28
Weavers	10	8	13	14	13	16	6	5	8	6	99
Vehicle drivers		1	2			2	1	1	1	1	9
Singers			4	1		1		3	1		10
Goldsmiths		1	2	2		3	3			1	12
Blacksmiths	2	1	1	1	1	2	1	4	2	3	18
Flour millers						1		1			2
Butchers	2		2	1	3	2		1			11
Contractors	10	1		1				2		5	19
Physicians	1			2		1	1		2		7
Tailors	1	2	5	8	5	1			5		27
Barbers	1	1	4	4			2	2			14
Fire works makers											
Tinsmiths					1						1
Tanners								1			1
Brass smiths	1	1		3				1			6
Oil distillers				1							1
Washermen				2						3	5
Pottery makers	1	3							1		5
Bakers										4	4
Skilled labourers		1	1		6					4	12

included in foci is also not as severe as that occurring in the interstitium reminding that the tubules are secondary affected.

It is macroscopically observed that the foci which fell into necrosis are found as pale yellowish spots over the surface or the cuts which Dr. Ohtawara in his splendid work made the criterion of presence of the virus.

The observation, as stated above, coincides with that of Councilmann that in most cases of human autopsy, the testicle tissue presents a more typical lesion caused by variola-virus especially than any other organs, and no contra-examinations of any sort ever show the same effect as reported in the previous anouncements.

PURPOSE OF THE PRESENT EXPERIMENTS.

As an extension of the application of my method, experiments with vaccinia-virus were undertaken in an attempt to define how the variola-virus penetrates into animal body.

It is a common belief that the variola-virus enters either through nose, nasopharynx and bronchi by respiration or from skin by contact, causing a local affection subsequently.

Such being the case, the usual supposition necessitated at first a focal affection propagated by the virus in the penetrated area, such as exanthems on the mucous membrane of the upper respiratory system or exanthems on the skin, in which the virus develops and then presumably gets into the blood circulation, affecting finally the whole body.

Since L. Pfeiffer reported about a quarter of a century ago his belief stating 'Ohne Epithelbetheiligung gibt es keine Übertragung von Variola und Vakzin,' the belief has long remained without any contradiction.

Recently, in a monograph entitled 'Studies on the viruses of vaccinia and variola,' Gordon reported his experiments on the permeability of various surfaces of rabbit to the virus of vaccinia. His work was conducted to ascertain the channels by which the virus may be successfully conveyed into the body under approximately natural conditions. Applying diluted vaccinia to the various surfaces of rabbits, namely, skin, ear, eye, nose, mouth, vagina, and rectum, he inoculated each of these rabbits cutaneously with decreasing doses of vaccinia-virus in the usual way, and proved the possibility of penetration in the external auditorial canal, the conjunctiva and nasal mucous membrane out of the seven surfaces in question.

The purpose of his work was thus like that of my present study, but the method by which he demonstrated the possibility of penetration differs greatly from mine. His method is an indirect proving of the problem by confirming the immunity of animals arising as the result of penetration of the virus. In the course of my experiments for the same purpose, I took more reasonable and sure ways than those of Gordon for the proof of the penetration of the virus.

It is a known fact that the testicle of rabbit is a very suitable medium for the multiplication of such viruses, and moreover, marked changes noticeable even to the naked eye are produced by the growing virus Taking account of these facts, Dr Ohtawara first demonstrated vaccinia virus in circulating blood by injecting into the testicle of a normal rabbit the blood and the emulsion of organs from rabbits cutaneously vaccinated and this method is confirmed by several scientists as a very effective one among many

Endeavouring to demonstrate the presence of variola virus in the blood or urine of the patients by the same testicular method and pursuing the literature on variola, I learned from pathologists that typical histopathological changes ascribed to the virus occur in several organs, especially in the testicle of patients

It seemed to me that the same changes could be seen microscopically in stained specimens of rabbit testicle when injected with the blood or filtered urine of the patients if the virus exists therein

The plan was justified by means of several experiments and thus, by injecting the blood or urine and observing the changes caused by the virus I initiated a more precise method for the demonstration of variola or vaccinia virus than that of Dr Ohtawara whose method depends upon macroscopic examination

The principal sign of the presence of the virus my improvement is made upon, is the cell infiltrations in a form which may be termed as 'focal lesion' found spottedly in the testicular tissue, the typical evidence of which can be seen when the inoculation is made with very diluted vaccinia and these milder touches as a rule, present under a weak magnification two or three foci in every visual field, which are found consisted of the interstitial tissue infiltrated with cells involving only two or three tubules on a ground remaining intact when highly magnified

The infiltrating cells are chiefly lymphocytes with many plasma cells and some histiocytes as well as polynuclear leucocytes which make appearance in some specimens, and the epithelium or spermatozoa in tubules even those situated within the foci are but under very slight and common degenerations, notably remaining intact, differing from that in the cases of other pathogenic microbes, e g, typhoid bacilli, etc

As the injection of vaccinia is increased, more marked effects can be seen accordingly and in the case of the great effect, the foci develop tremendously in their size and number involving the interstitial tissue between numerous tubules In such a case tubules occupying the central part of foci fall into necrosis including the epithelium as well as the interstitium and the infiltrating cells ending in the same fate and the debris of nuclei of decayed cells are amply found there, and polynuclear leucocytes concentrate the necrotic area and the surroundings as the changes grow on

But even in such high destructions there can be seen entirely or comparatively normal tissues existing among the decay, and change of spermatozoa in tubules

A STATISTICAL ENQUIRY INTO THE STATE OF VISION OF INDIAN STUDENTS IN CALCUTTA, SPECIALLY WITH REFERENCE TO PREVALENCE OF MYOPIA AT DIFFERENT AGES, AND INVESTIGATION OF THE FACTORS SUPPOSED TO INFLUENCE THE PROGRESS OF MYOPIA.

BY

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METHOD OF WORK.

THE plan in brief was rather to enquire into the state of vision of each and every student of one or two particular institutions thoroughly and carefully, than to get hold of as many students as may turn up, though not all the students of many institutions, hurriedly making a huge total number of students examined, distributed over many colleges and schools, but not forming a characteristic group in the statistics depicting fully the influence of particular factors on the progress of myopia in that group alone. It was also settled to test the eye-sight of students always from a distance of 6 metres from the test-types and never from distances of 3 or 4 metres, which system is conducive to producing incorrect results, and also to use discs of homatropine hydrochloride instead of atropine sulphate for cycloplægic action, whenever necessary, as the effect of the former lasts for a shorter time and has every chance of inducing a larger number of students to submit to be put under it for the objective tests.

The work was begun according to the following methods :—A case of test-lenses containing positive and negative cylindrical and spherical glasses, a pinhole disc, an opaque metal disc, a stenopæic slit, a trial frame with degrees for astigmatic axes inscribed on it, a Maddox rod, Snellen's sets of test-types for near and distant vision, and his sunrise chart, a rod 1 metre long, an ophthalmoscope with reversible mirrors, an electric torch-light, and Holmgren's colour vision-testing wools were procured. The order of testing vision followed was (*a*) to try with a few spherical concave and convex glasses, after recording the distant vision in a case with subnormal vision, (*b*) then to put into the eye a cyclopægic and do retinoscopy, ophthalmoscopic examination and subjective test again under the action of the cycloplægic, (*c*) then to do post-cycloplægic refraction. Each eye was tested separately by closing the other by an opaque disc, when the trial frame

Procedure of My Experiments

The testicular vaccinia was adopted for the experiments This is a vaccine which has become virulent by means of passage through testicles for 8 to 10 generations of rabbits

Experiment I —The diluted vaccinia soaked in a piece of cotton wool is applied to two rabbits with about 2 3 square centimetres of their rib skin cleanly shaven and after having carefully watched for a day to ascertain that there is no injury of any sort over the spots Blood collected from their aural veins at the end of 12, 24 hours, 2 and 4 days respectively is inoculated into the testicles of a healthy rabbit to prove the presence of the virus with the degeneration of the tissue

Experiment II —A few drops of the diluted vaccinia are applied into the auditory canal, and the proof of the virus is made in the same manner as described in Experiment I

Experiment III —Two hungry rabbits are fed with usual food containing the same vaccine for the alimental tests of possibility of virus entry The food was ascertained to have been wholly eaten by the animals within 2 hours' time, and their blood were examined at the usual schedule to see if the virus appears in the circulatory system

Experiment IV —The inhalation test Two rabbits fixed and completely wrapped in a piece of clothing excepting their nostrils through which the animals may inhale the sprayed diluted vaccinia The virus was proved to be in their blood at the usual times

Experiment V - The diluted vaccine is this time dropped in 5 doses into the eye lids of 2 rabbits and for 1 additional ones later, with 5 minutes' interval

The virus was presented in the same way as described in all previous tests

Conclusions

1 The vaccinia virus introduced into the rabbit body, through the skin, auditory canal mouth, nostrils and conjunctiva is always found affecting the animal penetrating through the inoculated spots

2 The virus thus entered into system, thrives within in all cases and appears in the blood circulation after a certain incubatory period reminding of the fact that the animal is infected

3 Admissibility of virus into the system seems to be varied according to the inoculated spots, i e, the hardest, in the case of cutaneous infection, the auditorial canal and the conjunctiva being next to it, and most easily through the alimental canal as well as by respiratory passage

4 The incubatory period the virus requires to make its appearance in the blood circulation starts on the third day after it is inoculated, and gradually diminishes after sixth day when the immunizing agent answers the case

There are no primary pustules formed on the spot where the virus is introduced unless there was some injury, that is to say, the malady is admissible into the system without any registration of its entry

fourth day. The distance at which the patient was placed for retinoscopic observations was always strictly 1 metre.

Use of the electric torch-light was made in the institutions which were not supplied with electric illumination for carrying out the objective examination when the eyes of the subject became fully dilated under the action of the cycloplægic. Kerosene oil and candle lights also served the purpose after a little practice.

In order to collect the family history and the personal history of some of the scholars of the higher classes, copies of the following printed questions (*see* Form I) were handed over to each of them and they were asked to write down the answers before any examination was undertaken for testing their eye-sights. In case of scholars of the lower classes, each of them was asked these questions verbally.

FORM I.

SHOWING QUESTIONS ANSWERED BY EACH SCHOLAR BEFORE BEING CALLED FOR EXAMINATION FOR SIGHT-TESTING.

1. What is your name ?
   (1) Class and College and Roll No. ?
2. Age ?
3. Caste ?
4. Address ?
5. Family History :—
   Has anybody among your blood relations—
   (1) Glasses for bad vision ?
   (2) Night-blindness ?
   (3) Diabetes ?
   (4) Or Cataract ?
6. Personal History :—
   (1) At what age did you begin study—at school or at home—kind of school you first joined ?
   (2) What is your posture during home-work ? Do you sit at desk or on ground ? Are you in the habit of stooping over your book while reading ?
   (3) Do you play games or take part in any physical exercise ? If so, for how long are you doing so ?
   (4) Did you suffer from any serious, prolonged illness ? If so, at what age and for how long ?
   (5) Do you study at night-time ? If so, for how many hours per day and years and in what light are you doing so ?
   (6) How many hours do you study at home ? Is it increasing steadily ?
   (7) Do you get headache ? If so, for how long are you getting it ?
   (8) Do you see well with each eye separately, both at a distance and at near (during reading) ? If not, for how long has your vision become dim ? Do you get pain in your eyes ? If so, for how long are you getting it ?
   (9) What food do you take ?

I. THE SANSKRIT COLLEGE, CALCUTTA.

The college is open to the Hindus occupying a respectable position in society, irrespective of caste.

The statistics collected from the examinations done in this institution are particularly valuable in demonstrating the prevalence of myopia among the Hindu students, as distinguished from the Mohammedan and Christian students who

was worn When a patient read 6/6 or * (distance in metres at which he was from the type by distance in metres at which one with normal eye sight should read the line) absence of myopia and astigmatism were assumed and his sight was reckoned either as normal (emmetropic) or hypermetropic, if any manifest hypermetropia became evident The *manifest hypermetropia* was determined by starting with a convex lens which blurred the types and then replacing it gradually by weaker convex lenses until the highest glass with which the patient read 6/6 was reached When the patient could not read 6/6 his vision was reckoned as subnormal (ametropic) and at first trial was made to improve it by spherical convex glasses and the strongest convex glass required showed the amount of hypermetropia, if the trial failed concave glasses were next tried to improve the vision and the weakest concave glass required denoted the amount of myopia if this trial failed, cylinders alone in various axes or in combination with spherical lenses (both convex and concave) were tried and the glass or glasses combined which succeeded in improving the sight showed the kind, the amount and the axis of the astigmatism present In determining astigmatism free use of the stenopæic slit in different axes and the sunrise chart of Snellen were made The following sign, hinting astigmatism as observed by Dr C E Shaw(1) was of great use to me — 'The patient reads several of the smaller lines of test types incorrectly With hypermetropia or myopia, it is common to see a patient read down to a certain line say 6 12 correctly and then stop but with a slight degree of astigmatism, he may read 6 12, 6/9 and 6/8 all incorrectly' The following facts, first pointed out by Dr Ramaswamy Iyengar(2) in India, was also observed by myself while estimating the refraction of astigmatic eyes —'Some of these astigmatics recognize some letters in the same line and not all the letters, some confound letters which have no resemblance to each other, and sometimes make out a complicated letter while they could not distinguish a simple one by its side Sometime a C was mistaken for an 'O," an 'L" for a 'Z" a P" for an F,' etc'

The near vision was tested next with Snellen's near types The patient was asked to read the smallest type (Sn D 0 50) The nearest point at which it could be read was measured with a graduated tape and the distance gave the near point or *punctum proximum* (P P) The farthest distance at which it could be read legibly denoted the far point or *punctum remotum* (P R) If the patient read fluently from a distance of 1 foot his vision was reckoned as normal and thus recorded Sn D 0 50 at 1 foot When a patient read fluently only when it was close to the eye, say at 5 inches, he was probably myopic and his near vision was thus recorded N V Sn D 0 50 at 5 inches (P R)

In the objective method for examinations with the ophthalmoscope and retinoscope under a cycloplegic, homatropine hydrochloride discs, each weighing 1/40 grain were used freely with cocaine hydrochloride solution 4 per cent dropped every 15 minutes for 5 times The pupil became fully dilated in an hour except in rare subjects of tender age, where atropine sulphate ½ per cent solution was ordered to be dropped thrice daily for 3 days and the examination was done on the

TABLE II.

Showing the number of students examined at the Sanskrit College with varieties of defective vision detected.

Class.	Total number examined.	Number of hyper-metropes.	Number of myopes.	Number of myopic astig-matics.	Number of hyper-metropic astig-matics.	Number of mixed astig-matics.	Amblyopes and sufferers from organic eye diseases.
1st year ..	49	13	13	4	0	0	1
2nd year ..	29	8	11	1	1	0	1
3rd year ..	87	30	27	8	4	0	2
4th year ..	58	26	17	5	1	1	1
TOTAL ..	223	77	68	18	6	1	5

Table II represents the number of boys examined in each class, with the results noted in different columns as to the defects of vision found. Out of the total number, 5, or 2 per cent of total, were amblyopes and sufferers from organic eye diseases, 170, or 75 per cent, were ametropes and the rest were emmetropes. Of the ametropes 77 were hypermetropes (that is, 34·5 per cent of the total), the majority having manifest hypermetropia without abnormal vision; 68, or 30·4 per cent of the total, had myopia; 18, or 8 per cent of the total, had myopic astigmatism; 6, or 2 per cent of the total had hypermetropic astigmatism, and only one had mixed astigmatism. The myopes and myopic astigmatics taken together numbered 86 or 38·5 per cent of the total. Of these 70 had errors of low degree up to — 2·50 D., the rest had errors of higher degree up to — 6·00 D. generally, only 1 had myopia of — 18·00 D. Two cases of myopia of higher degree were associated with alternating divergent strabismus of concommitant type and 3 with incomplete colour-blindness. Among the higher degree myopes some appeared to be of progressive types, but only 3 cases gave such history.

Thirty-five cases were examined objectively under homatropine and cocaine. Of these 4 had pseudo-myopia and complete paralysis of ciliary muscles by repeated applications of the cycloplægic was necessary in these cases, which really turned out to be cases of hypermetropia.

It is curious to note here that one case, which showed some manifest hypermetropia only, under the subjective test turned out to be a case of myopic astigmatism when under cycloplægic and was verified as such by objective tests. Seventeen out of the 35 cases turned out to be of myopia or myopic astigmatism and the objective tests with the ophthalmoscope and retinoscope corroborated the subjective tests with the glasses alone.

The following pathological lesions were found in these cases on ophthalmoscopic examination:—

(1) Crescent.

chiefly differ in their mode of living from the former, in having in their dietary a larger amount of meat and less vegetables

The college is attended by 315 day scholars, whose hours of attendance are from 11 A M to 4 P M every day, Sundays and holidays excepted, supplemented by average home work of 4 hours per day on the part of a scholar which increases at the time of examination There are 4 classes and 5 subjects, viz, Sanskrit, English, Bengalee, History and Philosophy all Arts subjects are taught No subject is taught for more than an hour each day A perusal through the following table will show the distribution of students in different classes and area, etc of different class rooms

TABLE I

Distribution of students and accommodation etc, in class rooms in the Sanskrit College

Classes	Area of floor	Number of students in each class	Area of windows and doors	Direction of day light on books of scholars	Approximate floor space per head in square feet
1st year	31 × 25	71	2 doors on north (9 4″ × 4 8″) + (9 4″ × 5) 2 windows on south 2 (9 4″ × 4 5″)	Light falls from the front of the majority and right side of the rest of students	10 9
2nd year	20 10″ × 18 8″	33	2 doors on west 2 (9 4″ × 3 11″) 1 window on east (9 4″ × 4 6″)	Light falls from the front.	11 2
3rd year	25 8″ × 26 4″	137	3 windows on south 2 (9 4″ × 4 4″) + (9 4″ × 5 10″) 2 doors on north (9 4″ × 4 4″) + (9 4″ × 5 10)	Light falls from the front of some and right side of majority of students.	4 9
4th year	25 3″ × 20 8″	74	1 door on west. (9 4″ × 5 10″) 4 windows on east and north 3 (9 4″ × 4 6″) + (9 4″ × 4 5″)	Light falls from the left of some and back of others	6 7

Out of 315 day scholars who attend the college only 223 submitted themselves for examination of their eyes, the rest were either absent or asserted themselves as having normal vision and avoided the examinations

The distribution of myopes according to ages is shown in Table III. It is evident from the said table that the greatest number of myopes are between the ages of 19 and 22.

The ages at which the disease first made its appearance either in the form of headache or dimness of vision or pain in the eye, as manifest from the personal history supplied by each myope, is given in percentages in Table IV. It will be evident from that table that the commonest age for the commencement of myopia varies between 16 and 21 years.

TABLE IV.

Showing the ages of commencement of myopia in percentages based on the personal history of 81 *myopic students examined at the Sanskrit College.*

Ages of commencement of myopia.	Percentage of myopia found.
At 13 ..	In $\frac{1}{81}$ or 1·2 per cent
„ 14 ..	„ $\frac{3}{81}$ or 3·7 „
„ 15 ..	„ $\frac{3}{81}$ or 3·7 „
„ 16 ..	„ $\frac{8}{81}$ or 9·8 „
„ 17 to 18 ..	„ $\frac{12}{81}$ or 14·8 „
„ 19 ..	„ $\frac{19}{81}$ or 23·4 „
„ 20 ..	„ $\frac{8}{81}$ or 9·8 „
„ 21 ..	„ $\frac{12}{81}$ or 14·8 „
„ 22 ..	„ $\frac{6}{81}$ or 7·4 „
„ 23 ..	„ $\frac{5}{81}$ or 6·1 „
„ 24 ..	„ $\frac{4}{81}$ or 4·9 „

In Tables III and IV the myopic astigmatics are included among the myopes in face of close relationship between the two diseases.

II. THE ST. PAUL'S SCHOOL.

After the examination of the state of vision of the students of the Government Sanskrit College was over, I began an enquiry into the state of vision of the students of the St. Paul's School, founded by the Church Missionary Society in 1822 and situated at 33, Amherst Street. The Institution prepares boys for the matriculation examination of the Calcutta University in 9 years, for which there are 9 classes.

(2) Annular ring
(3) Posterior staphyloma
(4) Choroiditis
(5) Changes in the shape of the disc —These changes were observed specially in cases of myopic astigmatism The disc was in such cases found to be oval in a direction opposite to the axis of the astigmatism

One case showed signs of optic neuritis in one eye The remainder of the cases were either emmetropic or hypermetropic and the fundus oculi in these were found normal Strange to say a few cases of hypermetropia revealed 'Crescent' like patches on temporal sides of their discs (though these were comparatively smaller in size than the myopic crescents), with irregular outlines

Out of the 170 ametropes 18 had anisometropia In Table II these cases are classified according to the eye which had greater defect Some had myopia in one eye and hypermetropia in the other Others had myopic astigmatism in one eye and simple myopia in the other, and so on

At the Sanskrit College the following faults in the seats and desks used by the scholars in their class rooms were universally found —

(1) No backs of benches
(2) Too great distance between seat and desk, both of which were fixed
(3) Disproportion between the height of the seat and of the desk
(4) Unsuitable slope and form of the desks, in fact no desk had any slope but all were flat topped

All these faults in seats and desks tend to a greater indulgence in the habit of stooping on the part of the scholars and may indirectly influence the progress of myopia

TABLE III

Showing the total number of students of different ages examined at the Sanskrit College with the number of myopes found at these ages represented in percentages

Ages	Number of students examined	Number of myopes found with percentages
16 to 17	13	5 or 38 per cent
18	19	5 or 26 ,,
19	32	16 or 50 ,,
20	38	17 or 52 ,,
21	39	18 or 46 ,,
22	31	10 or 32 ,,
23	22	6 or 27 ,,
24	13	5 or 38 ,,
25 and upwards to 30	16	4 or 25 ,,
TOTAL	223	[illegible]

TABLE V.

Distribution of students and accommodation in class-rooms at the St. Paul's School.

Classes.	Area of floor.	Number of students in each class.	Area of windows and doors.	Direction of day-light on books of scholars.	Approximate floor space per head in square feet.
Ex.-matric	22′ 6″ × 17′	10	1 west door and 1 east door each 9′ × 5′ and 1 north door and 1 south door each 6′ 10″ × 2′ 2″.	Light falls on the left side (west) of the majority of students.	38·2
1st ..	Do.	17	Do.	Do.	22·4
2nd ..	13′ 4″ × 15′	15	2 doors on north each 3′ 10″ × 6′ 10″ and 2 doors on south each 2′ 4″ × 6′ 10″.	Light falls from the left side (north) of the majority.	13·3
3rd ..	23′ × 16′	17	1 door 9′ × 5′ and 2 windows each 4′ × 9′ on east and 1 door 2′ 6″ × 7′ on west.	Light falls from the left side (east) of the majority.	21·6
4th ..	18′ 4″ × 12′ 2″	18	2 doors on north each 4′ × 7′ 1 door on south 2′ 6″ × 7′.	Light falls from the left (north) side of majority.	12·3
5th ..	25′ 6″ × 22′	27	3 arches on north each 4′ 4″ × 12′ and 1 door on south 4′ × 7′.	Light falls from the front (south) of the majority.	20·7
6th ..	24′ 2″ × 16′ 15″	23	2 doors on south 4′ × 7′ 9″ and 1, 2′ 9″ × 6′.	Light falls from the front of some and left of others (south).	11·7
7th ..	32′ × 22′	15	6 arches on north each 4′ 9″ × 12′ and 3 doors on south 4′ × 7′.	Light falls from the left of the majority (south).	46·9
8th A and B	....	24 (13+11)	9 arches on south each 4′ 4″ × 12′ and 3 doors on north each 4′ × 8′ and 2 doors each 2′ 6″ × 9′ and 1 door on east 4′ 6″ × 7′ and 1 door on west 9′ × 5′.	Light falls from the left side (south).	52·7

With exception of only one Hindu day-scholar, all the students who read here are Indian Christians * The statistics collected from the examinations done here is specially valuable in demonstrating the prevalence of myopia among the Indian Christian students of Calcutta, as distinguished from their Hindu and Mohammedan fellows As most of the students of this school were also boarders, the statistics will also help in ascertaining the influence of home conditions on the progress and prevalence of myopia In determining the influence of different factors on eye sight, it has been rightly pointed out by Karl Pearson that a ' careful distinction must be made between the home environment and the school environment '(3) Unless the pupils are followed in their homes it is almost impossible to discern how far bad food, bad posture assumed during study at home, bad light, bad air, lack of physical exercise and games, and such other factors influence the progress of myopia

The St Paul's School is attended by 176 scholars, of whom 121 are also boarders Their hours of attendance at school is from 10 A M to 4 P M on week days, excepting Saturday when it is up to 1 P M only The hours of study do not run concurrently, there being an interval of 10 minutes after 11 30 and half an hour after 1-15 P M each day In addition to work at school the boarders of the first 4 classes have to do home work for $3\frac{1}{2}$ hours and those of the 5th class 3 hours each day, out of which 2 hours are kept for work at night-time in artificial light Similarly, the boarders of the 6th class had to do home work for $2\frac{1}{2}$ hours out of which $1\frac{1}{2}$ hours are at night-time and those of the 7th and 8th classes for 2 hours, out of which 1 hour is at night time each day Games are compulsory for students of all ages and classes Attached to the school is an extensive playground measuring about 6 bighas Here, according to the season, football and hockey for three-quarters of an hour, cricket for an hour and a half, and athletic sports are the games played for 3 days in the week under the supervision of the teachers between 4 and 6 P M Besides, the students of the 2nd to 6th classes drill one day every week 4-15 to 4-45 P M The students of the 7th and 8th classes drill for 5 days in the week The boy scouts numbering about 30 mostly from the 1st and ex-matriculation classes are exempted from the drill Daily morning bath is compulsory for all the boys and on Sundays they are given complete bodily and mental rest.

The boarders' dietary consists of boiled rice, dal and a curry both in the morning and evening. Meat is supplied 3 days in the week and fish on the rest of the days Regular tiffin is supplied twice in the day and consists of ' Halwa ' at daybreak at 6-30 A M. and bread with butter or biscuits at 1-30 P M. No beverages like tea are allowed. Smoking is strictly forbidden

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* The Institution has been made open to a limited number of non Christian day scholars only in the present year.

In Table VI the number of boys examined in each class with the results of the examinations as to the kinds of defects of vision found are enumerated. Hearty thanks are due to the Rev. Mr. Deane, the Principal of the Institution, who was all attention to me and without whose strenuous persuasion it would have been impossible to get hold of almost every scholar for sight-testing. Out of a total of 176 scholars in the school 163 were examined, the rest were either ill or for some reason or other absent from the school.

Out of 163 boys examined 127, or 73 per cent, had errors of refraction, 7, or 4·5 per cent, had amblyopia or organic diseases of the eye hampering vision and the remainder were emmetropic. Out of the ametropes 85, or 52 per cent of the total, had hypermetropia, mostly having manifest hypermetropia without abnormal vision ; 79, or 11·6 per cent of the total, had myopia ; 9, or 55 per cent of the total, had myopic astigmatism ; 8, or 4·8 per cent of the total, had hypermetropic astigmatism. Out of the 7 classed as amblyopes and sufferers from organic eye disease only one showed signs of optic atrophy on ophthalmoscopic examination under homatropine and cocaine, the rest had abnormal vision in one or other or both eyes, which could not be improved with glasses. Several cases had $\frac{6}{6}$ (?) vision in one eye only, which could not be corrected with glasses but these are classified as emmetropes, the abnormality of vision being too low. The myopes and myopic astigmatics taken together numbered 28, i.e., 17 per cent of the total. All the cases had low degrees of errors of refraction none exceeding — 4·00 dioptres. Thirty cases were examined objectively under homatropine and cocaine; 3 turned out to be pseudo-myopia and 2 pseudo-myopic astigmatism, being due to the spasm of the accommodation. These cases changed into either hypermetropic astigmatism or hypermetropia on the application of the cycloplægic which paralyzed the accommodation. In the remaining cases, the subjective tests were confirmed by retinoscopy and ophthalmoscopy. These included 12 cases of myopia, 5 cases of myopic astigmatism, 4 of hypermetropia and 5 of hypermetropic astigmatism. Choroiditis was found in 2 cases with myopia over — 3·00 D. sph. and change in the shape of the optic disc was observed in 5 cases of myopic astigmatism. One case of myopia of — 3·50 D. sph. showed crescent on temporal side of the disc, which also looked somewhat pale on that side. Several cases had anisometropia and in Table VI these are classified according to the eye which had greater defect as was done in the previous section. One case had paralysis of accommodation in the left eye, which he ascribed to injury with cricket ball 5 years ago. The pupil appeared oval and dilated. Vision was $\frac{6}{6}$ with + 1·25 D. sph. H.M. in that eye. Only 2 cases of single concommitant convergent strabismus were found. Both were hypermetropes. No cases of colour-blindness were detected.

In Table VII the distribution of myopes of St. Paul's School at particular ages is shown. It corresponds to Table III of Section I and demonstrates the prevalence of myopia to be less here than that at the Sanskrit College.

The dormitory consists of well ventilated and lighted halls containing rows of iron bedsteads, one for each boarder, strictly serving for sleeping and resting only. The boarders study in separate rooms, provided with benches and desks only, so that there is no opportunity for them to indulge in bad postures like reading with the head stooped low either in the recumbent or squatting attitude on the bed. In the boarding houses electricity is the source of artificial light for reading at night time The lamps are shaded and hung from the ceilings in such a way that light falls from above and front on the books of the scholars without its rays getting direct entrance into their eyes

As in comparison with the Hindu students examined at the Sanskrit College, the majority of whom live in crowded and ill-ventilated houses, take part in no physical exercise, and stoop down while reading, the Christian students of the St. Paul's School show less prevalence of myopia among themselves One cannot set aside the influence of hygienic factors—like good light, wholesome food, pure air, regular hours of physical exercise alternating with regular hours of study in ideal posture and so on—upon the disease, of course at the same time the difference in ages, the standard of study and the habits and customs peculiar to the community, if any, must also be fully taken into account

In Table V the numerical distribution of the students in different classes together with the accommodation and facilities for the entrance of light and air in each class room is shown

TABLE VI

Showing the number of students examined at the St Paul's School with varieties of defective vision detected.

Classes	Total number examined	Number of hyper-metropes	Number of myopes	Number of myopic astigmatics	Number of hyper metropic astigmatics	Amblyopes and sufferers from organic eye diseases
1st and Ex matric	25	13	6	0	2	0
2nd	14	8	1	2	0	0
3rd	16	8	6	0	0	1
4th	17	10	1	0	1	3
5th	24	13	2	3	1	0
6th	29	10	2	3	2	1
7th	15	9	0	0	0	1
8th	23	14	1	1	2	1
TOTAL	163	85	19	9	8	7

in all its classes except the last one, while in the other high schools lower courses of Sanskrit literature are taught in the 4 upper classes only.

As regards physical culture, at the Sanskrit Collegiate School games or such other forms of physical exercises are not compulsory, nor has the Institution any play-ground of its own, or attached athletic clubs. The only game indulged in by the boys is that of basket-ball, which is played every day, after school hours, in presence of a teacher, in the small court-yard of the school, by not more than two dozen students. Another dozen students attend the gymnasium attached to the school between 5-30 P.M. and 6-30 P.M. every evening and receives instruction from the school gymnastics master, though not regularly. For all the students, except those of the matriculation class, drill is compulsory and is done for 20 minutes a day during school hours, 2 to 4 days in the week, under the guidance of the drill master. No student here is a boy scout.

As regards home conditions, the influence of these could not be studied personally, all the students of the Sanskrit Collegiate School being day-scholars. However from the statements made by the students it may be concluded that they were mostly non-smokers and living with their parents in dingy rooms which were parts of rented houses, in some cases in the ground-floors and situated in narrow lanes, where entrance of light and air were out of question. Most of them had no desks or stools but read in the stooping posture either on the ground or on a wooden cot. Their night work was done either with kerosene oil lights or in castor oil lamps, and no attention was paid to the position of the light in relation to the books. Their hours of study at home were unusually long in comparison with that of the boarders of the St. Paul's School. It seemed that all the leisure they had after attending the school was taken up in study and there appeared no graduated diminution in hours of study at home from the highest to the lowest classes.

As regards dietary, most of the students being sons of Brahmin Pandits were not allowed to take meat, and milk, being costly, could not take its place. The diet was mainly farinaceous consisting of rice and vegetables, dal and fish in meagre quantity were the only sources of protein in their dietary. A few were strict vegetarians, being sons of orthodox Hindus.

The school is attended by 174 day-scholars, of whom 160 had their eye-sight tested, the rest were absent from the school on the days on which the sight-testing of their class-fellows was carried out.

Table VIII shows the numerical distribution of the students in different classes, together with the accommodation and facilities for the entrance of light and air in each class-room. Excepting the 4th and 5th classes, in which there were seats with back-rests attached to the desks, which had adjustable slopes, all other classes had improper seats and desks, as was the case in the college department. In some classes the blackboards were placed in dark corners.

TABLE VII

Showing the total number of students of particular ages examined at the St Paul s School and the number of myopes amongst each age group with percentages

Ages	Number of students examined	Number of myopes found with percentages
6 to 7	4	0 o 0 per cent
8 to 9	17	2 or 11 6
10 to 11	35	3 or 8 5
12 to 13	42	8 or 19
14 to 15	29	5 or 17 2
16 to 17	24	8 or 33 3
18 to 19	11	2 or 18 1

Four cases of amblyopia were examined objectively under homatropine and cocaine All these showed signs of hypermetropia on retinoscopy in both axes Three showed no abnormality in the fundus or the disc on ophthalmoscopic examination the remaining one showed signs of suspected optic atrophy

III THE SANSKRIT COLLEGIATE SCHOOL

The next institution in which the state of vision of the students was enquired into was the Sanskrit Collegiate School situated in the ground floors of the Sanskrit College at 1, College Square Calcutta The Sanskrit College which was founded in 1824 was bifurcated into the School and College departments in 1851 The school consists of 10 classes and prepares students for the matriculation examination of the Calcutta University in 10 years It is open to Hindus only and admits day scholars who attend from 10 30 A M to 3 15 P M with half an hour s interval at 1 P M every day on week days excepting Saturday when the school closes at 2 P M Besides there are recesses once for 10 minutes at 12 noon and again for 5 minutes at 3 P M

The statistics collected from the examinations of the eye sights of the Hindu students of this Institution can well be compared with that of the Indian Christian students of the St Paul s School and the difference may be explained by the difference in curriculum and hours of study dietary physical culture home conditions and habits and customs peculiar to the two communities concerned The curriculum of study at the Sanskrit Collegiate School differs from that at the St Paul s and such other high schools in there being special courses in Sanskrit literature

TABLE VIII—*concld.*

Classes.	Area of floor.	Number of students in each class.	Area of windows and doors.	Direction of day-light on books of scholars.	Approximate floor space per head in square feet.
7th ..	25′ × 16′ 5″	17	1 north and 1 south doors each 3′ 10″ × 9′ 3″ ; 2 east doors each 1′ 9″ × 9′ 3″.	Light falls from the left (north) of some as well as front (south) of rest of students.	24·1
8th ..	25′ 3″ × 13′ 7″	14	1 south door 3′ 10″ × 9′ 3″; 1 north door 4′ 4″ × 9′ 3″; 2 west doors each 1′ 9″ × 9′ 3″.	Light falls from back (south) of some as well as front (south) of rest of students.	24·4
9th ..	13′ 2″ × 11′ 10″	9	1 north window 3 9″ × 8′ 9″; 1 west door 4′ 4″ × 9′ 3″; 1 south door 3′ 10″ × 9′ 3″.	Light falls from the front (west) of half and from the right (north) side of other half of students.	17·2

TABLE IX.

Number of students examined at the Sanskrit Collegiate School with varieties of defective vision detected.

Classes.	Total number examined.	Number of hyper-metropes.	Number of myopes.	Number of myopic astig-matics.	Number of mixed astig-matics.	Number of hyper-metropic astig-matics.	Amblyopes and sufferers from organic eye diseases.
1st ..	18	7	7	1	1	0	0
2nd ..	17	9	4	2	0	1	0
3rd ..	19	5	6	2	0	2	0
4th A & B	28	4	7	3	0	5	1
5th ..	19	8	2	3	0	2	0
6th ..	21	5	9	3	0	0	2
7th ..	17	5	1	3	0	1	0
8th ..	13	2	0	4	0	2	0
9th ..	8	6	1	0	0	0	1
TOTAL ..	160	51	37	21	1	13	4

Table VIII.

Distribution of students and accommodation in class-rooms at the Sanskrit Collegiate School

Classes	Area of floor	Number of students in each class	Area of windows and doors	Direction of day light on books of scholars	Approximate floor space per head in square feet
1st	28′ 4″ × 24′ 9″	19	2 north doors 3′ 10″ × 9′ 3″, 5′ 4″ × 9′ 3″, 3 south doors 2 each 3′ 10″ × 9′-3″, 5′ 4″ × 9′ 3″	Light falls both from left (north) and right (south) side of students more from right side	33 8
2nd	24′ 11″ × 24′ 8″	18	1 north door 3′ 10″ × 9′ 3″, 2 south doors each 3′ 10″ × 9′ 3″	Do	34 1
3rd	20′ × 17′ 11″	20	1 west window 3′ 10″ × 8′ 9″, 2 east doors each 3′ 10″ × 9′ 3″	Light falls from the left (east) of the majority and right (west) of a few students	18 3
4th A	24′ 3″ × 19′ 9″	22	2 west windows each 3′ 10″ × 8′ 8″, 2 north windows each 3′ 10″ × 8′ 9″, 1 east door 3′ 10″ × 9′ 3″	Light falls from back (north) as well as right (west) side of students	21 7
4th B.	25′ 3″ × 19′ 7″	11	2 east and 2 north windows each 3′ 10″ × 8′ 9″ 1 west door 3′ 10″ × 9′ 3″ 1 south door 4′ 4″ × 9′ 3″	Light falls from the left (west) side of the students	14 9
5th	20′ 1″ × 17′ 10″	20	1 east window 3′ 10″ × 8′ 9″, 2 west doors each 3′ 10″ × 9′ 3″, 1 south door 4′ 4″ × 9′ 3″, 1 north door 4′ 4″ × 9′ 3″	Light falls from the left (west) side of the students	17 9
6th	20′ 3″ × 17′ 10″	24	2 west doors each 3′ 10″ × 9′ 3″, 1 south door 4′ 4″ × 9′ 3″, 1 north door 4′ 4″ × 9′ 3″.	Light falls from the left (west) side of students	1[illegible]

TABLE X.

Showing the total number of students of particular ages examined at the Sanskrit Collegiate School and the number of myopes amongst each such age group with percentages.

Ages.	Number of students examined.	Number of myopes found with percentages.
6 to 7	2	0 or 0 per cent
8 to 9	12	4 or 33 ,,
10 to 11	23	7 or 30 ,,
12 to 13	38	16 or 42 ,,
14 to 15	37	12 or 32 ,,
16 to 17	34	14 or 41 ,,
18 to 19 and above ..	14	5 or 35 ,,

In Table X the distribution of myopes of the Sanskrit Collegiate School at particular ages is depicted. It demonstrates the prevalence of myopia to be greater among the Hindu students of the Sanskrit Collegiate School than among the Indian Christian students of the St. Paul's School considered age for age.

IV. THE ST. PAUL'S COLLEGE, CALCUTTA.

The next institution visited was the St. Paul's Cathedral College, situated at 33, Amherst Street, in separate premises but in the same compound with the St. Paul's School. It was founded in 1865 as the Cathedral Mission College and is now affiliated to the Calcutta University up to the B.A. standard in English (honours), Bengalee history (honours), economics, philosophy, Sanskrit, and mathematics ; in addition to these subjects chemistry is taught to the intermediate students.

The college is open alike to students of all religions and sects. There are 4 classes and the students take the B. A. degree in 4 years, reading for 1 year in each class.

The statistics collected from the examinations done here will show the difference in the prevalence and progress of myopia among groups of Hindu, Mohammedan and Christian students living in one place in identical hygienic surroundings, and persuing the same courses of study. It will also show the difference in the prevalence of the disease between the Indian Christian students who pass their matriculation examination from the St. Paul's School, after their

Table IX shows the number of boys examined in each class with the results of the examinations as to the kinds of defects of vision found

Out of 160 boys examined 123 or 76 per cent had errors of refraction and 4 or 2 5 per cent had amblyopia or organic eye diseases hampering vision, the remaining were emmetropes 51, or 31 8 per cent of the total number examined had hypermetropia which in most cases represented manifest hypermetropia with normal vision 37 or 23 1 per cent of the total, had myopia 21, or 13 1 per cent of the total had myopic astigmatism Only one student had mixed astigmatism Out of the four students classed as amblyopes one had concomitant convergent strabismus in the left eye, the vision of which could only be improved to [illegible] with — 3 00 D sph another had vision of [illegible] in both eyes and another had vision of [illegible] in both eyes both of whom were tried with all combinations of glasses but the vision could not be improved further The remaining case had its vision improved to [illegible] in both eyes with convex glasses when under atropine the error was made out by retinoscopy On opthalmoscopic examination the right eye showed signs of optic neuritis in the disc and the left eye showed signs of iritis with anterior synechiae which prevented the dilatation of the pupil to the full extent On examination with the corneal loupe after oblique illumination corneæ of both eyes showed signs of a mild type of interstitial keratitis Several cases had [illegible] (?) vision in one or both eyes examined separately which could not be corrected with glasses These cases are classified as emmetropes as was done in the case of the St Paul's School boys, the abnormality of vision being of the lowest possible degree One fact which may be uniformly recorded about these cases is that all the cases were of boys under 12 years of age—an age which is young enough to be considered something like a transitional period in the life of the student when ametropia is just appearing in the tender eyeball but not developed into a particular type All cases of anisometropia are classified according to the eye which had greater degree of error of refraction as was done in the previous sections

Cases of myopia and myopic astigmatism taken together numbered 58 i e, 36 2 per cent of the total number examined Out of these 44 or 27 5 per cent of the total number examined, had errors of refraction below — 1 00 D, 10 or 6 2 per cent of the total had errors of refraction ranging between — 1 00 D and — 3 00 D, and only 4, or 2 5 per cent of the total had errors of refraction ranging between — 3 00 D and — 5 00 D Seven cases were examined objectively under homatropine and cocaine One case of pseudo myopia was detected the error of refraction changed into hypermetropic astigmatism as soon as the spasm of accommodation was overcome by paralysis of the ciliary muscles on the application of the cycloplegic In the remaining cases the subjective tests were confirmed by retinoscopy and ophthalmoscopy One case of hypermetropia showed a crescent-like patch on the temporal side of the left disc One case of myopia over — 1 00 D. sph B E showed posterior staphyloma in the right optic disc and retinal changes in left fundus oculi

TABLE XI.

Accommodation, ventilation and distribution of light in class-rooms at the St. Paul's College.

Classes.	Area of floor.	Area of windows and doors.	Distribution of day-light on books of scholars.	Maximum number of scholars occupying the class at a time.	Approximate floor space per head in square feet.
Mathematics ..	25′ 6″×25′ 6″	1 door on west 3′ 7″×8′ 3″. 1 window on east 4′ 11″×3′ 7″. 3 windows north each do. Sash over each window each 2′×3′ 7″ and 2 ventilators near ceiling.	Light comes from back of students (north).	30	21·6
Chemistry ..	25′ 6″×24′ 6″	2 doors on north each 3′ 7″×8′ 3″. 3 windows on south each 4′ 11″×3′ 7″ with sash over each window each 2′×3′ 7″ and 3 ventilators near ceiling.	Light comes from the left of students (south).	50	15·08
Philosophy and Logic ..	25′ 6″×25′ 6″	On the south 2 windows each 7′ 11″×3′ 8″ and 1, 4′ 11″×3′ 8″, 3 ventilators near ceiling. On the west 3 windows each 7′ 11″×3′ 8″. On east 1 door 3′ 8″×8′ 3″.	Light comes from the front (west) and from left (south) of students.	42	16·1
Sanskrit ..	24′ 2″×26′ 3″	On the south 3 windows each 3′ 8″×7′ 11″. On the north 2 doors each 3′ 8″×8′ 3″.	Light comes from the left and front (east) (south).	35	18·1
English and Economics.	25′ 6″×25′ 6″	2 windows on east each 3′ 8″×7′ 11″. 3 windows on north each 3′ 8″×7′ 11″. 6 ventilators at the ceiling. 2 doors on south each 3′ 8″×8′ 3″.	Light comes from the left (east) and front (south).	66	9·8
History ..	26′ 1″×19′ 10″	2 windows on south each 3′ 8″×7′ 11″, 1 door on north 3′ 8″ × 8′ 3″, 1 window on north 3′ 10″×5′ 7″.	Light comes from the left (south).	25	20·6

whole boyhood is passed in it as boarders, where physical exercise and study are held in equal importance by the teachers, and those who take admission into the college after finishing their school education in other institutions, especially all such Christians It is evident that even if the 4 years of college life be spent in the best hygienic environment, when the boy has already grown into a man, the evil effects which have once followed the longer years of school life when the child has been developing into the adult in probably a most unhygienic environment cannot be undone In fact, many students enter the college after they have developed myopia or other errors of refraction in their school career in other institutions In this connection we must also remember that the connection of all the students with the college may not be for 4 years for many take admission into the 2nd or 3rd year classes

Although the majority of the St Paul's College students are resident in the 2 hostels situated in the same compound with the college building we cannot lay as much stress on the influence of home environment specially of the conditions of physical exercise dietary and posture at study on the progress and prevalence of myopia as we did in case of the school In case of boarders of the college department, though there are rules making physical exercise compulsory and fixing hours of study outside lecture hours these are not enforced with the same strictness by the authorities as is done at the school Though groups of students are often seen engaged in the spacious college grounds in the gymnasium and some of the professors take a leading part in the games I have come across students, while I was taking down their personal history who wilfully avoided physical exercise and devoted prolonged hours to study

As regards dietary the diet taken by the Hindu boarders is inferior in protein content to that taken by their Christian and Mohammedan fellow boarders for being allowed to make arrangements for the cooking of their food according to their own custom seldom do they take meat There are two separate dining rooms provided for the Hindus Meals are served twice, at 9 30 A M and between 7 and 8 15 P M

As regards the posture adopted by the boarders during study, all sorts of bad postures are assumed by them, there being no separate study rooms provided only with desks and seats, as is the case in the St Paul's School The rows of single seated rooms of the fine looking three storied hostel buildings, though well lighted and airy and also adequately illuminated at night time by electric lights hung from the roofs contain the desk and the chair for study, as well as the wooden bedstead for sleeping and so their occupants, the students, give preference to the bed for all purposes In many instances they study on the bed either in the posture of lying over their chest or back, or sitting in the squatting or some such awkward posture, always stooping over the book

Hearty thanks are due to the Principal of the college, the Rev I C Dewick, M A, who kindly arranged for the tests to be carried out in the well lighted verandah of the college library, which was more than 6 metres long

TABLE XI.

Accommodation, ventilation and distribution of light in the [illegible]

Classes.	Area of floor.	[illegible]	[illegible]	[illegible]	[illegible]
Mathematics ..	25′ 6″ 25′ 6″	[illegible]	[illegible]	[illegible]	[illegible]
Chemistry ..	25′ 6″ 21′ 6″	2 [illegible]	[illegible]	[illegible]	[illegible]
Philosophy and Logic ..	25′ 6″ 25′ 6″	[illegible] 7′ 11″ [illegible]	[illegible]	[illegible]	[illegible]
Sanskrit ..	24′ 2″ 26′ 5″	[illegible] 7′ 11″ [illegible]	[illegible]	[illegible]	[illegible]
English and Economic .	25′ 6″ 25′ 6″	2 [illegible] 7′ 11″ [illegible]	[illegible]	[illegible]	[illegible]
History ..	26′ 1″ 10′ 10″	2 windows [illegible] 7′ 11″ [illegible] north 3′ 10″ [illegible]	[illegible]	[illegible]	[illegible]

The College is attended by 234 scholars of whom 144 are boarders Out of the total number 203 had their eye sight tested, the rest were absent from the sight testing examinations on the days on which these were carried out Out of the 203 students examined 130 turned out to be boarders, resident in the college hostels Their hours of attendance at the college was from 10 A M to 4 30 P M every day, excepting holidays and Sundays The time of attendance was divided into several periods of 50 minutes each and one subject was taught in every such period For all the students the periods do not run continuously They are allowed to take up 5 subjects only in the Intermediate or the 1st two years of their course of study and 4 subjects only in the B A or the last two years of their course, the different groups of students get intervals of 50 minutes between lecture periods, when the subject not taken up by the particular group is taught Besides there is an interval of a quarter of an hour at 1–45 to 2 P M for all the students

Table XI shows the accommodation and the facilities for the entrance of light and air in each class room Unlike other institutions visited the class rooms in the St Paul s College are named according to the subjects which are taught in these and the students of all the years from the 1st to the 4th year classes occupy the same room whenever they study the same subject but different hours are fixed for each class All the classes had benches with no back rests and flat desks with no slopes and all seats and desks were of uniform height in all the classes In the mathematics class as the light came from the back of the students the shadow of their bodies had every chance to fall on their object of study In other classes the arrangements for the entrance of light was good

TABLE XII

Total number of students and the number examined in the different classes of the St Paul s College with varieties of defective vision detected

Classes	Number of students in each class	Total number examined	Number of hyper metropes	Number of myopes	Number of myopic astig matics	Number of hyper metropic astig matics	Amblyopes and sufferers from organic eye diseases
1st year	65	50	34	10	2	1	1
2nd year	62	55	20	17	5	3	2
3rd year	44	37	16	14	2	0	2
4th year	63	61	34	16	6	1	2
TOTAL 1st to 4th years	234	203	104	57	15	5	7

Table XII shows the numerical distribution of students in different classes ther with the total number of cases examined in each class, and the results of examinations as to the nature of the defects of vision found. Out of 203 boys nined 181, or 89 per cent, had errors of refraction and 7, or 3·4 per cent, had lyopia or organic eye diseases hampering vision; the remaining were ietropes. 104, or 51·2 per cent of the total number examined, had hyper-ropia, which in most cases represented manifest hypermetropia without ab-nal vision, that is, had $\frac{6}{6}$ vision. 57, or 28 per cent of the total, had myopia; or 7·3 per cent of the total, had myopic astigmatism; 5, or 2·4 per cent, had ermetropic astigmatism.

Out of the 7 students classed under amblyopes one had paralytic divergent bismus in the left eye since birth and the vision in it was $\frac{6}{18}$ which could be improved with glasses, the other eye had myopia of — 1·00 D. sph. h improved the vision from $\frac{6}{18}$ to $\frac{6}{6}$. Though this is a case of anisometropia, has been classified under amblyopia; for all cases of anisometropia in previous sections were classified according to the eye which had greater ct and this plan had also been followed in this section. The next case vision of $\frac{6}{6}$ in the right eye, which could not be improved with glasses; the r eye was normal. The next case was that of a student whose left eye was blind the right eye had vision = finger movements at 2 inches—the result of small-6 years ago. He was using special types for the blind in reading the textbooks. next case had vision = P.L. and P.R. in the left eye, while the right eye had sion with + 0·75 D. sph. of manifest hypermetropia. The next case had vision $\frac{1}{60}$ in the right eye, and vision = counts finger at 1 foot in the left, both of h could not be improved with glasses at all. Another case had vision of $\frac{6}{60}$ ie left eye, which improved to $\frac{6}{36}$ and no further with + 6·00 D. sph.; the t eye having full vision of $\frac{6}{6}$ with manifest hypermetropia of + 0·25 D. sph. cases had $\frac{6}{9}$ (?) vision in both eyes examined separately, which could not be ected with glasses. These cases are classified as emmetropes as was done in previous section.

Cases of myopia and myopic astigmatism taken together numbered 72, i.e., per cent of the total number examined. Out of these 40, or 19·7 per cent of total number examined, had errors of refraction below — 1·00 D.; 19, or 9·3 cent of the total, had errors of refraction between — 1·00 D. and — 3·00 D.; 13, or 6·4 per cent of the total, had errors of refraction ranging between 3·00 D. and — 6·00 D. One case of myopia had internal concomitant bismus of the left eye, which had amblyopia.

Only 6 cases were examined objectively under homatropine and cocaine. case turned out to be pseudo-myopia in the left eye, the error of refraction aged into hypermetropia from myopia; as soon as the spasm of accommo-on was overcome by paralysis of the ciliary muscles on the application of the oplægic. But on ophthalmoscopic examination something like a crescent seen to be present on the temporal side of the disc; the other remained

The College is attended by 231 scholars of whom 114 are boarders Out of the total number 203 had their eye sight tested the rest were absent from the sight testing examinations on the days on which these were carried out Out of the 203 students examined 130 turned out to be boarders, resident in the college hostels Their hours of attendance at the college was from 10 A M to 4 30 P M every day, excepting holidays and Sundays The time of attendance was divided into several periods of 50 minutes each and one subject was taught in every such period For all the students the periods do not run continuously They are allowed to take up 5 subjects only in the Intermediate or the 1st two years of their course of study and 4 subjects only in the B A or the last two years of their course, the different groups of students get intervals of 50 minutes between lecture periods when the subject not taken up by the particular group is taught Besides, there is an interval of a quarter of an hour at 1–45 to 2 P M for all the students

Table XI shows the accommodation and the facilities for the entrance of light and air in each class room Unlike other institutions visited the class rooms in the St Paul's College are named according to the subjects which are taught in these and the students of all the years from the 1st to the 4th year classes occupy the same room whenever they study the same subject but different hours are fixed for each class All the classes had benches with no back rests and flat desks with no slopes and all seats and desks were of uniform height in all the classes In the mathematics class as the light came from the back of the students the shadow of their bodies had every chance to fall on their object of study In other classes the arrangements for the entrance of light was good

TABLE XII

Total number of students and the number examined in the different classes of the St Paul's College with varieties of defective vision detected

Classes	Number of students in each class.	Total number examined	Number of hyper metropes	Number of myopes	Number of myopic astig matics	Number of hyper metropic astig matics	Amblyopes and sufferers from organic eye diseases
1st year	65	50	34	10	2	1	1
2nd year	62	55	20	17	5	3	2
3rd year	41	37	16	14	2	0	2
4th year	63	61	34	16	6	1	2
TOTAL 1st to 4th years	231	203	104	57	15	5	7

TABLE XIV.

Showing the total number of students of particular ages examined at the St. Paul's College and the number of myopes among each such age group with percentages.

Ages.	Number of students examined.	Number of myopes found with percentages.
16 to 17 ..	30	11 or 36·6 per cent.
18 ..	30	10 or 33·3 „
19 ..	45	14 or 31·1 „
20 ..	48	18 or 37·5 „
21 ..	17	6 or 35·8 „
22 ..	12	5 or 41·6 „
23 ..	12	5 or 41·6 „
24 ..	7	3 or 42·8 „
25 to 32 ..	2	0 „
TOTAL 16 to 32 ..	203	72 or 35·4 per cent.

TABLE XV.

Sub-races of Christians examined at the St. Paul's College with their total number and prevalence of myopia among them.

Sub-races of Christians including the Bengalee Christians.	Total number.	Number of myopes found with percentages.
Behari	1	0 per cent.
Syrian (from Travancore)	13	7 or 53·8 „
Assamese	2	2 or 100 „
Khasi	1	0 „
Naga	1	0 „
Sonthali (from Ranchi)	2	0 „
Draon	1	0 „
Lushai	1	0 „
Garo	1	0 „
Bengalee	16	6 or 37·5 „
TOTAL ..	39	15 or 38·4 „

Table XV shows the different sub-races of Christians reading in the St. Paul's College together with number of myopes and their percentages in each such sub-race. It will show how much the Syrian Christians of Travancore are affected with myopia. Their habits of beginning school at an early age, studious and assuming bad posture, as well as disinclination to join in games, as will be seen in their personal histories, are the obvious causes for it.

myopic, but the degree of myopia became reduced a great deal at the post cyclo plægic refraction In the remaining cases the subjective tests were confirmed by retinoscopy and ophthalmoscopy One case of myopia above − 1 00 D sph and another — 6 00 showed posterior staphyloma B L on ophthalmoscopic examination

TABLE XIII

Total number of Hindu Mohammedan Indian Christian Buddhist and Brahmo students examined at the St Paul's College and the prevalence of myopes among each of them

Communities	Total number	Number of myopes	Percentage of myopes
Hindu	156	54	34 6 per cent
Mohammedan	6	2	33 3
Indian Christian	39	15	38 4
Buddhist	1	0	
Brahmo	1	1	

Table XIII shows the total number of students of different communities examined in the St Paul's College viz, the Mohammedan the Hindu the Buddhist, the Christian, the Brahmo together with the presence of myopia in percentages as calculated from the total number of myopes in each such community In this table all cases of myopia and myopic astigmatism are classified as myopes In this table the Indian Christians include all the Christians residing in the St Paul's College, even those who call themselves Syrian Christians and come to study at Calcutta all the way from Travancore which country they have adopted as their own some generations ago At first sight it appears anomalous to find such a high percentage of myopia among the Christian students of the college as compared with those of other communities, while in the school it was very low The reason for this becomes clear, as soon as we know that of the 38 Christian students examined at the college only 12 have joined it after finishing their school career at the St Paul's School and out of these 12 only 1, or 33 3 per cent are myopic

Table XIV shows the distribution of myopes at particular ages at the St Paul's College The number of myopes steadily increases with the increase of age from 16 to 21 in case of the St Paul's College.

Out of 96 students whose eye-sights were tested 76, or 79 per cent, had errors of refraction and 2, or 2·09 per cent, had amblyopia or organic eye diseases hampering vision ; the remaining were emmetropes. Twenty, or 20·8 per cent of the total number examined, had hypermetropia, which in most cases represented manifest hypermetropia with normal vision. Thirty-four or 35·4 per cent of the total number, had myopia. Fifteen, or 15·6 per cent of the total, had myopia astigmatism. Seven, or 7·2 per cent of the total, had hyperopic astigmatism. Out of the 2 students classed as amblyopes, one had vision of $\frac{6}{18}$ in both the eyes which could not be improved with glasses, the other had vision of $\frac{6}{60}$ in the right eye which could not be improved with glasses and in the left eye the vision was $\frac{6}{36}$ which improved to $\frac{6}{6}$ with — 4·00 D. sph. One case with normal vision had di-chromatic colour-blindness. Though the latter was a case of ametropia in the left eye, it has been classed under amblyopia ; for all cases of anisometropia in the previous sections were classified according to the eye which had greater defect and this plan has also been followed in this section. One case had $\frac{6}{6}$ (??) vision in the right eye which could not be improved with glasses. This case had been classed as emmetrope ; the abnormality of vision being of very low degree, as was done in other sections.

Cases of myopia and myopic astigmatism taken together numbered 49, or 51 per cent of the total number of students examined. Out of these 15, or 15·6 per cent of the total number examined, had errors of refraction below — 1·00 D. sph. ; 15, or 15·5 per cent again of the total, had errors of refraction between — 1·00 D. sph. and — 3·00 D. sph. ; and 19, or 19·7 per cent of the total, had errors of refraction ranging between — 3·00 D. sph. and — 7·00 D. sph.

TABLE XVI.

Total number of students in and the number examined in each class of the Bethune College with varieties of defective vision counted.

Classes.	Number of students in each class.	Total number examined.	Number of hyper-metropes.	Number of myopes.	Number of myopic astig-matics.	Number of hyper-metropic astig-matics.	Amblyopes and sufferers from organic eye diseases.
1st year ..	38	31	6	12	4	5	0
2nd ,, ..	35	25	6	8	3	1	1
3rd ,, ..	20	19	4	5	5	0	0
4th ,, ..	23	21	4	9	3	1	1
TOTAL 1st to 4th years. ..	116	96	20	34	15	7	2

V The Bethune College Calcutta

The Bethune College, situated at 181 Cornwallis Street, Calcutta was affiliated to the University of Calcutta in 1879 and is now open to lady students of all ages and nationalities, and teaches up to the B A Standard

The statistics collected from the examination done in this institution is particularly valuable in demonstrating the prevalence of myopia among the female sex of different communities as distinguished from the male sex As students from the Indian Christian, Brahmo and Hindu community are studying in this Institution we will also know the relative prevalence of the disease among the female sex of these different communities persuing an identical course of study in an identical school environment, though not home environments

The college is attended by 110 scholars of whom 18 only are resident in the hostel within the college compound 23 are resident in a hostel outside the college compound and the rest are day scholars Their hours of attendance at the college are from 10 30 A M to 3 30 P M every day excepting Saturdays Sundays and holidays The time is divided into 6 periods each of which lasts for 45 minutes There is an interval between periods of study for half an hour each day between 12 15 P M and 1 15 P M The following subjects are taught in the college — English Bengalee, history economics philosophy Sanskrit mathematics and botany There are 4 classes and the students take their B A degree in 4 years reading for 1 year in each class No subject is taught for more than 1 period in each class each day

All the tables are based on cases recorded in the supplement Hearty thanks are due to the Lady Principal of the College Miss G M Wright, who allowed the students to come one by one during class hours in a verandah on the north east, *which was 6 metres long and profusely lighted* *She also very kindly* allowed one lady teacher to be present during the sight testing to act as a chaperon

As only 17 students were boarders in the college hostel, nothing of vital importance could be ascertained about the influence of home conditions on the eye sight of the majority The only students of the college who participated in any kind of physical exercise were these boarders, most of whom played regular games of tennis and badminton on the college lawns every evening The rest of the students did no other physical exercise than walking on the roofs of their respective residential houses

As regards postures adopted during study, *only* a minority, namely [illegible] boarders, were strictly using desks in the *erect posture*, the rest of the [illegible] indulged in the stooping habit, both while *working on* a desk and on the [illegible] their homes Some of them had developed a *habit* of studying while [illegible] or lying in the bed

As regards dietary while the Christian and some of the Brahmo [illegible] were in the habit of taking meat *regularly* with their food, the Hindu [illegible] scarcely eating meat *A few of the Hindus* were strict vegetarians

TABLE XVIII.

Total number of students of Hindu, Indian Christian and Brahmo communities examined at the Bethune College and the prevalence of myopia among each such community.

Communities.	Total number of students examined.	Number of myopes found.	Percentage of myopes.
Hindu ..	24	9	37·5 per cent
Indian Christian ..	15	8	53·3 ,,
Brahmo ..	57	32	56·1 ,,
GRAND TOTAL ..	96	49	51·0 ,,

Table XVIII shows the total number of students of different communities examined at the Bethune College, together with the presence of myopia in percentages as calculated from the total number of myopes in each such community.

TABLE XIX.

Showing the total number of students of particular ages examined at the Bethune College and the number of myopes with percentages found among each such age group.

Ages.	Number of students examined.	Number of myopes with percentages.
16 ..	7	2 or 28·5 per cent
17 ..	11	7 or 63·6 ,,
18 ..	17	11 or 64·7 ,,
19 ..	25	9 or 36·0 ,,
20 ..	17	9 or 52·9 ,,
21 ..	12	8 or 66·6 ,,
22 to 24 ..	6	3 or 50·0 ,,
25 to 28 ..	3	0 or 0·0 ,,

Table XIX shows the distribution of myopes at particular ages at the Bethune College.

In the last two tables all cases of myopia and myopic astigmatism are classed together as myopes.

Table XVI shows the numerical distribution of students in different classes as examined by me together with nature of defects of vision found in each class counted separately

TABLE XVII

Accommodation, ventilation, and distribution of light in class rooms at the Bethune College, Calcutta

Classes	Area of floor	Area of windows and doors	Distribution of day light on books of scholars	Approximate floor space per head in square feet
1st year	18 × 20	2 doors on north each 4′ 6″ × 10′ 6″	Light comes from left (north) of students	11 6
2nd ,,	18 × 20	2 doors on north plus 2 doors on east each 4′ 6″ 10 6″	Light comes from right (north) and back (east) of students	14 4
3rd ,,	12 × 20	2 doors on south each 10 6″ × 4′ 4″ plus 1 door on west 8′ 6″ × 4′ 6″.	Light comes from left (south) of students	18 0
4th ,,	12′ × 20′	2 doors on south each 10 6″ × 4′ 5″ plus 1 door on each 10′ 6″ × 4′ 5″.	Light comes from left and front (south) of majority of students	17 0

Table XVII shows the accommodation and the facilities for the entrance of light and air in each class-room The 1st, 2nd and 4th year classes were supplied with rows of dual benches with back rests, attached not to these benches, but to the front of desks just behind, which served as book rests for the next rows of seats The benches were $1\frac{1}{2}$ feet high and 1 foot wide The desks were also dual and sloped very gradually and imperceptibly. Only the 3rd year class was supplied with flat-topped single desks each of which had a separate chair, which served as the seat. Electric lights and fans were provided in each class and were fixed at advantageous positions. The position of the blackboards were good in all the classes. In the 2nd year class as the light came from the right side as well as back of the students, the shadows of their bodies and of their right arm while writing had every chance of falling on their objects of study, which being in darkness were liable to put extra strain on their eye-sight. In other classes the arrangements for the entrance of light were good.

twice a week by the students of Standard V, and for half a period thrice a week by the students of the Standards IV, III, II, I and infant class. In the grounds of the school compound there are arrangements for the games of lawn tennis, badminton and croquet and the head-mistress told me that she induced the boarders to take part in these games regularly, though there were no rules making games compulsory. Most of the day-scholars took no other physical exercise at their homes except a little walking either on house-roofs or in public squares, if there were any nearby.

As regards dietary, the majority of the day-scholars being Hindus partook of rice, vegetable, dal and fish, for which meat was substituted on rare occasions. The boarders had five meals a day and meat was supplied twice in the week.

Hearty thanks are due to the head-mistress, Miss H. Sen, who was all attention to me and allowed the students to come one by one during the class hours; the vision in each case was subjectively tested from a distance of 6 metres, in a well-lighted verandah.

Out of 182 students whose eye-sights were tested 121, or 66·4 per cent, had errors of refraction. If we omit 50 scholars out of 121 with errors of refraction, as these scholars had only manifest hypermetropic with $\frac{6}{6}$ vision, we get 71 only, or 39 per cent of the total number examined, as having abnormal vision. Only 8, or 4 per cent out of the total number examined, had amblyopia or some organic eye disease hampering vision. The rest of the scholars were emmetropic.

Out of the ametropes 70, or 38 per cent of the total number examined, had hypermetropia; 30, or 16·4 per cent of the total number examined, had myopia; 9, or 4·9 per cent of the total, had myopic astigmatism; and 12, or 6·5 per cent of the total, had hyperopic astigmatism. Out of 8 students classed as amblyopes one had vision of $\frac{6}{36}$ in the right eye which improved to $\frac{6}{18}$ with —1·00 D. sph.; and $\frac{6}{18}$ in the left eye which could not be improved with glasses. The left eye in addition had concomitant convergent strabismus. Other cases had $\frac{6}{9}$ vision in both eyes which could not be improved with glasses. A further case had $\frac{6}{12}$ vision in both eyes which could not be improved with glasses. Another case had emmetropia in the right eye, but $\frac{6}{9}$ vision in the left eye which could not be improved with glasses and had in addition concomitant convergent strabismus. Though the last case is one of anisometropia it has been classed as an amblyope, because all cases of anisometropia in previous sections are classified according to the eye which had greater defect and not as a separate class. Several cases had $\frac{6}{6}$ (?) vision in one or both eyes examined separately which could not be improved with glasses. As such cases are classified as emmetropes, the abnormality of vision being of the lowest possible degree and safely negligible. As most of these cases were of girls under 12 years of age, cannot we consider this age as something like a transitional period in the life of the scholar, when ametropia is just forming in the tender eye-ball but not yet assumed any definite type? Besides the 2 cases of concomitant convergent monocular strabismus described before and classed under amblyopes

From the perusal of the last two tables it will be seen that myopia is most prevalent among the Brahmo lady students of the Bethune College and least so among their Hindu class fellows and that the disease increases gradually in percentage as the age of the pupils advances from 16 to 21 years and it becomes rare after the age of 25

Several cases were examined objectively with the result that the subjective tests were confirmed

VI The Bethune Collegiate School

The Bethune Collegiate School is situated at 181, Cornwallis Street in a splendid compound with the college of that name but in two separate blocks Founded by the Honourable J E D Bethune in 1849 it has come under Government control since 1856 It is open to girls of all religions and creeds occupying a respectable position in society It prepares girls for the matriculation examination of the Calcutta University in 10 years for which there are 10 classes Besides there is an infant class In addition to the courses of study prescribed for the matriculation examination the girls are taught music and needlework in all the classes except the 1st class The English language is taught from the infant class

The statistics collected from the examinations done in this institution will demonstrate the difference in prevalence of myopia among the younger female scholars of different communities, persuing an identical course of study in an identical school environment though not same social or home surroundings

Out of 182 students examined only 15 were resident in a boarding in a separate building but in the same compound with the school and the rest were day scholars Their hours of attendance at the school are from 10 30 A M to 3 30 P M every day excepting Saturdays, Sundays and holidays These hours are divided into periods of 15 minutes each and only one subject is taught in a period in a class In the infant class one subject is taught for half a period only There is a general recess for tiffin for half an hour each day from 12 15 P M to 1 15 P M

As regards home conditions only 15 students being boarders nothing in detail could be ascertained about the majority of the students The 15 boarders had one hall in the boarding which was provided with electric lights and fans and contained 15 beds and served as the dormitory The reading is generally done in the school rooms which were in most cases provided with single or dual seats with back rests and sloping adjustable desks The dormitory served the purpose of resting and sleeping only The school rooms were also provided with lights and fans, and consisted of rows of one storied rooms Most of the day scholars also gave a history of using electric light at night time for their study Most of them indulged in the habit of stooping over their books and working both at desk and on the ground without any restriction

As regards physical exercise nothing was compulsory for the scholars excepting drill from the 3rd to the infant classes It was done for half a period once a week by the students of the 3rd, 4th, and 5th (Standard VI) classes, for half a period

TABLE XXI.

Accommodation, ventilation, and distribution of light in class-rooms of the Bethune Collegiate School.

Classes.	Area of floor.	Area of windows and doors.	Distribution of daylight on books of scholars.	Approximate floor space per head in square feet.
1st	20′×19′ 6″	2 doors on south each 7′ 6″ ×3′ 6″. 4 windows, 3 on north and 1 on south each 4′ × 3′ 6″.	Light comes more from left (south) and also from right (north) but less.	..
2nd	20′×19′ 6″	Do.	Do.	..
3rd	16′ 8″×19′ 6″	Do.	Do.	..
4th	16′ 8″×19′ 6″	Do.	Do.	..
5th or Standard VI	Do.	Do.	Do.	..
6th or Standard V	20′×19′ 6″	Do.	Do.	..
7th or Standard IV	Do.	Do.	Do.	..
8th or Standard III	Do.	Do.	Do.	..
9th or Standard II	27′ 10″×12′ 11″	Doors, 1 on north, 1 on south, 4 on east, 2 on west each 6′ 3″×4′.	Light comes more from left (east) and also from right (west) but less.	..
10th or Standard I	17′ 11″×12′ 11″	Doors, 1 on north, 2 on east, 2 on west each 6′ 3″ × 4′.	Do.	..
Infant	17′ 10″×13′ 10″	Doors, 1 on south, 2 on east, 2 on west each 6′ 3″×4′.	Do.	..

Table XXI shows the accommodation and the facilities for the entrance of light and air in each class-room. In all the classes more light was coming from the left than the right side, excepting in Standard I where in addition to light from right and left sides, light was also coming from back of the students. All classes had revolving blackboards in good positions, which appeared recently painted and also skylights above the level of windows and doors. Besides, there were electric lights and fans in each class.

All cases of myopia and myopic astigmatism taken together numbered 39, or 21·4 per cent of the total number examined. Out of these 24, or 13·1 per cent of the total number examined, showed myopia of less than —1·00 D. sph.; 8, or 4 per cent of the total number examined, showed myopia ranging between —1·00 D. sph. and —3·00 D. sph., and 7, or 3·8 per cent of the total number examined, showed myopia ranging between —3·00 D. sph. and —6·00 D. sph. In this connection

there were 2 other such cases, 1 in a hypermetrope with $\frac{6}{9}$ vision and the other in a case of hypermetropic astigmatism. There were 3 cases of monochromatic colour-blindness, 2 of these had hypermetropic astigmatism and 1 amblyopia in both eyes with vision $\frac{6}{6}$.

Table XX.

Total number of students and the number examined in each class of the Bethune Collegiate School with varieties of defective vision found.

Classes.	Number of students on the roll	Number examined	Number of hypermetropes	Number of myopes	Number of myopic astigmatism.	Number of hypermetropic astigmatism	Amblyopes and sufferers from organic eye diseases
Ex-matric and 1st	11+10=21	11+10=21	3+4=7	3+3=6	1+2=3	2+10=12	0
2nd	7	6	0	3	0	1	0
3rd	10	7	2	1	1	0	0
4th	11	10	3	4	1	0	0
5th or Standard VI	14	10	4	5	1	0	0
6th or Standard V	19	17	7	3	1	0	0
7th or Standard IV	23	18	11	3	0	1	0
8th or Standard III	30	27	9	0	0	6	1
9th or Standard II	26	21	9	3	1	1	1
10th or Standard I	29	27	14	0	1	0	5
Infant .. .	20	18	4	2	0	1	1
Total of all classes ..	210	182	70	30	9	22	8

Table XX shows the numerical distribution of students in different classes presented to me for sight-testing, together with the nature of defects of vision found in each class counted separately.

From the perusal of Table XXII it will be evident that among the girls of the Bethune Collegiate School myopia, unknown at the age of 5, first appears at the age of 8, and increases in percentage from the age of 12 onwards.

Many cases were examined objectively and subjective tests were thereby confirmed.

VII. The Calcutta Madrassa (Anglo-Persian Department).

The Anglo-Persian Department of the Calcutta Madrassa occupies the ground-floors of the big building on the north of Wellesley Square. It is under Government control and is affiliated to the Calcutta University up to the matriculation standard and is open to Mohammedans only.

The statistics collected from the examinations done in this institution will demonstrate the prevalence of myopia among the scholars hailing from the Mussulman community as distinguished from the Hindu and the Christian communities.

The Hindus differ from the Mussulmans chiefly in their dietary and social customs. The latter are fond of meat and have no objection in including beef frequently in their dietary, the former seldom partake of meat and do not touch beef. Consanguinity in marriages is common among the Mussulmans but is strictly forbidden among the Hindus. The Indian Christians are as fond of meat as the Mussulmans, but are more cleanly in habits and love sport and physical exercise more than either the Hindus or the Mussulmans.

327 students were examined in the institution. Out of these 26 students were resident in 2 hostels called the Elliot and the Baker hostels, situated in premises opposite to the school, but in separate compounds, the latter on the north of the former. The rest of the students were day-scholars. Their hours of attendance at the school are from 10-30 A.M. to 4 P.M. every day excepting Fridays, Saturdays, Sundays and holidays. On Fridays they attend in the morning from 6-30 A.M. to 10 A.M. and on Saturdays from 10-30 A.M. to 2 P.M. As usual Sunday is a holiday. These hours are divided into periods of 45 minutes each and only one subject is taught for one period only. There is a general recess for tiffin for half an hour each day during the school hours after 1 P.M. except on Saturdays and Fridays.

As regards home conditions only 26 out of all the students examined being boarders nothing in detail could be ascertained about the majority of the students. Each of the boarders had his own bed, desk and chair in a room which was usually a four-seated one in the Elliot hostel and a single-seated in the Baker hostel. All the boarders could use electric lights which were provided in all the rooms for their study at night-time but most of them did not always use desks for their study. The bed and the desk being close to each other the students usually preferred to sit on their bed for study. Most of the boarders said to me that they took part in physical exercise regularly. Almost all the students of the Anglo-Persian Department were residents in the Elliot and a few only in the Baker hostel.

the term 'myopia' used is to include cases of both simple myopia and myopic astigmatism. The word is used in the same sense in the tables

TABLE XXII.

Showing the total number of students of particular age groups examined at the Bethune Collegiate School and the number of myopes found among each such age group with their percentages

Ages	Number examined	Number of myopes with percentages
5	2	0
6	1	0
7	9	0
8	13	1 or 7 per cent
9	24	1 or 4 "
10	39	4 or 10 "
11	22	4 or 18 "
12	22	6 or 27 "
13	12	8 or 66 "
14	13	5 or 38 "
15	11	6 or 54 "
16	4	1 or 25 "
17	3	0
18	5	2 or 40 "
19	2	1 or 50 "

Table XXII shows the total number of scholars of particular ages examined at the Bethune Collegiate School and the number of myopes found at those ages

TABLE XXIII

Total number of students of Hindu, Indian Christian, and Brahmo communities examined at the Bethune Collegiate School and the prevalence of myopia among each such community

Communities	Total number of students examined	Number of myopes found	Percentage of myopes
Hindu	136	22	16 per cent
Brahmo ..	39	13	33 "
Indian Christian ..	7	4	57 "
Total of all communities	182	39	

Table XXIII shows the total number of Hindu, Brahmo and Indian Christian students examined at the Bethune Collegiate School with the number of myopes found in each of these communities and their percentages.

Table XXIV.

Total number of students on roll and the number examined for sight-testing in each class of the Calcutta Madrassa, Anglo-Persian Department, with number of different types of defective vision found.

Classes.	Total number of students.	Number examined.	Number of hyper-metropes with normal vision.	Number of hyper-metropes with sub-normal vision.	Number of myopes.	Number of myopic astigmatics.	Number of hyper-metropic astigmatics.	Number of mixed astigmatics.	Amblyopes and sufferers from organic eye diseases.
1st	79	65	12	4	8	18	0	0	6
2nd	61	41	7	2	7	7	2	1	4
3rd	57	45	7	3	5	6	5	0	2
4th	51	43	5	2	13	4	8	0	0
5th or Standard VI ..	31	26	2	7	5	2	3	0	1
6th or Standard V ..	35	24	1	6	7	3	2	0	0
7th Class A or Standard IV.	31	29	9	3	7	2	2	0	1
7th Class B or Standard III.	31	19	2	7	7	0	1	0	0
8th Class A or Standard II.	23	19	3	2	3	0	0	0	1
8th Class B or Standard I.	23	16	9	1	0	1	0	0	1
Total ..	422	327	57	37	62	43	23	1	16

Hearty thanks are due to the head master, Khan Sahib Muhammad Yusuf, who allowed the sight testing to be carried out in a well lighted room 22 feet long on south east of the building and compelled almost all the students to present themselves one by one for the sight testing All the tests were carried out by making the students sit at a distance of 6 metres

Out of 327 students whose eye sight was tested, 223, or 67 8 per cent, had errors of refraction But out of these 223, 57 had only manifest hypermetropia with $\frac{6}{6}$ vision and omitting the 57 from 223 or 166 i e 50 7 per cent of the total number examined had errors of refraction with abnormal vision Only 16, or 1 8 per cent of the total number examined had amblyopia or some organic intra ocular disease hampering vision, which could not be corrected by glasses either in one or both eyes The rest of the scholars examined were found to be emmetropic

Out of the ametropes with abnormal vision 37 or 11 3 per cent of the total number examined, had hypermetropia, 62, or 18 9 per cent of the total number examined, had myopia, 43 or 13 1 per cent of the total had myopic astigmatism 23, or 7 03 per cent of the total had hypermetropic astigmatism and 1 only or 0 03 per cent of the total, had mixed astigmatism Out of 16 students classed as amblyopes 1 had vision of $\frac{6}{9}$(?) in the right eye with manifest hypermetropia of 0 25 D sph it became $\frac{6}{6}$ with the left eye he could count fingers at 2 metres only, with C +5 00 D sph its vision improved to $\frac{6}{18}$ and no further Though this is a case of anisometropia it has been classed as amblyopia because all cases in previous sections are classified according to the eye which had greater defect and not as a separate class Another amblyope had vision of $\frac{6}{18}$ in both eyes With −0 50 D sph the right eye improved to $\frac{6}{12}$(?) and no further Another case had vision of $\frac{6}{12}$ in the right eye which improved with +0 50 D sph to $\frac{6}{9}$ and no further In the left eye the vision was $\frac{6}{60}$ and it could be improved to $\frac{6}{18}$ with +1 00 D sph and no further The vision in a further case in the left eye amounted to counting of fingers at 1 metre and could not be improved at all That in the right eye was $\frac{6}{9}$(?) Homatropine and cocaine were applied to both eyes, and objective examination revealed total hypermetropia of 0 75 D sph in the right eye with fundus oculi normal and compound hypermetropic astigmatism in left eye In the left eye the vision improved to $\frac{6}{36}$ C +10 00 D sph C +5 00 D cyl axis horizontal and disc appeared to be very small and fundus showed signs of old retinitis One case had vision of $\frac{6}{9}$ in both eyes which could not be improved Objective examination under homatropine and cocaine showed the discs to be vertically oval and showed a little choroiditis in the fundi One case had vision amounting to counting of fingers at $\frac{1}{2}$ metre only in the right eye which could not be improved at all and the left eye had $\frac{6}{9}$ vision which could also be improved no further Another case had vision amounting to counting of fingers at $1\frac{1}{2}$ metre in the right eye which improved to $\frac{6}{24}$ with +1 00 D sph and the left eye had vision $\frac{6}{9}$(?) which

TABLE XXV—*concld.*

Classes.	Area of floor.	Area of windows and doors.	Distribution of day-light on books of scholars.	Approximate floor space per head in square feet.
2nd Class B ..	25′ 5″ × 13′ 8″	1 door on east and 2 on west, each 3′ 10″ × 8′ 6″ and 1 window on east 3′ 10″ × 5′ 5″.	Light from left (east) of scholars.	..
3rd Class A ..	31′ 7″ × 15′ 9″	1 door on west and 2 on east, each 3′ 10″ × 8′ 6″; 1 window on east and 1 window on south, each 3′ 10″ × 5′ 5″.	Light from left (east) and front (south) of scholars.	..
3rd Class B ..	24′ 8″ × 14′ 6″	1 door on north, 1 on south, 1 on east and 1 on west, each 3′ 10″ × 8′ 6″.	Light from back (north) and front (south) of scholars.	..
4th Class A ..	17′ 8″ × 16′ 8″	2 doors on south, each 3′ 10″ × 8′ 6″; 2 windows on north and 2 windows on west, each 3′ 10″ × 5′ 5″.	Light from left (north) and back (west) of scholars.	
4th Class B ..	21′ 8″ × 16′ 5″	1 door on north, 1 on south, 1 on east and 1 on west, each 3′ 10″ × 8′ 6″.	Light from right (north) of scholars.	..
5th Class or Standard VI.	30′ 0″ × 12′ 0″	2 doors on north, each 3′ 10″ × 8′ 6″ and 2 windows on south, each 3′ 10″ × 5′ 5″.	Light from left (south) of scholars.	..
6th Class or Standard V.	31′ 9″ × 16′ 0″	1 door on east and 2 doors on west, each 3′ 10″ × 8′ 6″; 1 window on west and 1 on south, each 3′ 10″ × 5′ 5″.	Light from right (west) and front (south) of scholars.	..
7th Class A or Standard IV.	14′ 0″ × 14′ 0″	1 door on south and 1 door on north, each 3′ 10″ × 8′ 6″.	Light from (south) of some and left (north) of other scholars.	..
7th Class B or Standard III.	14′ 0″ × 14′ 0″	Do.	Light from right (south) of scholars.	..
8th Class A or Standard II.	13′ 10″ × 12′ 0″	1 door on north 3′ 10″ × 8′ 6″ and 1 window on south 3′ 10″ × 5′ 5″.	Light from right (south) of scholars.	..
8th Class B or Standard I.	14′ 0″ × 14′ 2″	1 door on north and 1 door on south, each 3′ 10″ × 8′ 6″.	Light from front (south) of scholars.	..

Table XXV shows the accommodation and the facilities for the entrance of light and air in each class-room. Light was coming from the left in all the classes except 2nd class A and Standards I to IV in which the light was coming from the right side. The north side of 3rd class was rather dark.

with +0 25 D sph became $\frac{6}{6}$ Case 1117 resembled this case as regards right eye, in the left eye the vision was $\frac{6}{9}$ which with −0 25 D sph improved to $\frac{6}{6}$(?) and no further Another case had $\frac{6}{9}$ vision in the right eye which with −0 25 D cyl axis vertical became normal, in the left eye the vision was $\frac{6}{18}$ and could not be improved Another case had $\frac{6}{9}$(??) vision in the right eye which with +0 25 D cyl axis horizontal, became normal, in the left eye the vision amounted to counting of fingers at 1 metre which could be improved to $\frac{6}{36}$ with +5 00 D sph and no further Another case had $\frac{6}{9}$ vision in the right eye, and one case had such vision in both eyes which could not be improved The left eye was normal in yet another case A further series of cases had $\frac{6}{6}$(?) or $\frac{6}{9}$(??) vision in one or both eyes examined separately Some of these could not be corrected with glasses and yet are reckoned as emmetropic the abnormality of vision being of the lowest degree and safely negligible for all practical purposes A case of simple hyperopic astigmatism, one emmetrope and one of compound myopic astigmatism had monochromatic colour blindness One case of monocular myopia had alternating divergent strabismus One case of amblyopia had paralytic divergent strabismus of right eye It subsequently changed to myopic astigmatism when tested objectively under atropine, but as the vision did not improve further than $\frac{6}{9}$ it is classed under amblyopia Another case of amblyopia had similar squint The case had the left eye atrophied as result of smallpox, the other eye was normal Another case had [illegible] vision in right eye owing to central leucoma, the result of corneal ulcer some years ago, the other eye was normal

Table XXIV shows the total numerical distribution of students in different classes in the number presented to me for sight testing and the number of different types of defects of vision found in each class counted separately, and shown in different columns

TABLE XXV

Accommodation, ventilation, and distribution of light in class rooms of the Calcutta Madrassa, Anglo Persian Department

Classes.	Area of floor	Area of windows and doors	Distribution of day light on books of scholars	Approximate floor space per head in square feet.
1st Class A	31 0"×15 8"	3 windows on east each 3 10"×5 5" and 1 door on west 3 10"×6 0"	Light from left (east) of scholars	.
1st Class B	26 3"×13 8"	2 windows on east, each 3 10"×5 5" and 2 doors on west 3 10"×8 0"	Light comes from left (east) of scholars	
2nd Class A	20 7"×11 9"	2 windows on south each 3 10"×5 5" 2 doors on north each 3 10"×8 6"	Light from right (south) of scholars.	

PROVINCIAL POST-MORTEMS.

BY

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WITH proper tact post-mortem material so valuable in health administration can be gathered in the provinces as well as in the city. The work gives health officers an opportunity to preach the importance of public health education and preventive medicine. The reason why many object to post-mortem examination is not necessarily sentimental but because they do not understand its object and the benefits derived from it. The co-operation and support from other health officers in the locality, private practitioners and others acquainted with its importance is very necessary. Transportation facilities, proper care of the cadaver after the examination, a talk to the relatives after the examination and a prompt administration of prophylactic measures, should there be any, help much in gathering public confidence.

(2) Statistical data show that in the town of Zamboanga, province of Zamboanga, Philippines, with its cosmopolitan population of about 7,000 and accessible 'barrio' population of 20,000 with the exception of some transients, supplied 835 post-mortems during the last 6 years and 7 months. There were 18 post-mortems in 1920 and 242 in 1925. About 44·0 per cent of these were deaths in the Zamboanga General Hospital. In 1920 only 10·4 per cent of all deaths in the hospital were subjected to post-mortem, in 1925, 72·5 per cent.

(3) Of these 835 cases, 731 were Christian Filipinos; 41 Mohammedan Filipinos (Moros); 34 Chinese; 14 Americans; 9 Japanese; 3 Spaniards; and 3 other nationalities.

(4) Table I shows the causes of the death classified and shows that among Christian Filipinos above 1 year old the most prevalent cause of death is respiratory, due to prevalence of pulmonary tuberculosis (67 out of 500 deaths), while among Christian Filipino infants, cardiac disease, due to infantile beri-beri (94 out of 231 deaths). Among Moros, violence (21 out of 41 deaths) caused the most deaths. Excluding this factor, cardiac disease, mostly beri-beri, gave the highest incidence. Among the Chinese, violence (9 out of 34 deaths) also caused the most deaths. Excluding this factor, intestinal disease registered the most cases. Among Americans, cardiac disease due to cardio-renal complex and among Japanese, malaria caused the highest mortality.

TABLE XXVI

Showing the total number of students of particular age groups examined at the Calcutta Madrassa and the number of myopes found among each such age group with their percentages

Ages	Number examined	Number of myopes with percentages
6	1	4 or 22 per cent (ages 6–9)
7	4	
8	5	
9	8	
10	21	5 or 25 ,,
11	26	10 } or 26 (ages 11–12)
12	46	9
13	26	10 } or 26 ,, (ages 13–14)
14	31	5
15	36	12 } or 37 (ages 15–16)
16	53	21
17	30	10 } or 40 (ages 17–18)
18	25	12
19	5	4 } or 63 ,, (ages 19–20)
20	6	3
21	2 }	1 or 25 ,, (ages 21–22)
22	2 }	

Table XXVI shows the total number of scholars of parti[illegible] examined at the Calcutta Madrassa and the number of myopes found [illegible]

Myopes and myopic astigmatics taken together numbe[illegible] per cent of the total number examined Out of these 77, or 23 5 per [illegible] total number examined, showed myopia of less than – 1 00 D [illegible] of [illegible] total number examined, showed myopia ranging be[illegible] –3 00 and 5, or 1 5 per cent of the total number exa[illegible] between —3 00 D and —6 00 D In this con[illegible] to include cases both of myopia and myop[illegible]

REFE[illegible]

(1) SHAW, C F (1913) [illegible]

(2) IYENGAR, R [illegible]

(3) KARL PEARSON (1[illegible]) [illegible]

(5) Incidences of intestinal parasites based on recovered adult worms from 477 intestinal contents are shown in Table II.

(6) The maternal death due to parturition was found to be 3·8 per cent, apparently a high figure.

(7) Among accidental deaths motor vehicles as a cause ranks with the same number for drowning, 9 cases each out of 39 deaths. Among the homicides 21 out of 27 cases were caused by cutting instruments. Among suicides the Christian Filipinos used cutting instruments 6 times out of 10 cases; the Chinese drank 'sanki' (*Illiceum religiosum*) concoction 3 times out of 5 cases; the Spaniard used firearms once.

(8) Malignant tumours were found in 5·4 per cent of Christian Filipinos over 1 year old. Among the carcinomata 6 out of 15 cases were in the liver (4 primaries and 2 of the bile duct origin). Lymphosarcoma of the intestine and mesentery was found 4 times out of 9 sarcomata.

TABLE II.

Showing the Different Parasitic Incidences in Different Groups.

	Christian Filipinos above 1 year of age.	Christian Filipino infants 1 year or under.	Moros.	Chinese.	Americans.
	Percentage.	Percentage.	Percentage.	Percentage.	Percentage.
Ascaris ..	50·8	16·5	55·5	41·2	20·0
Trichuris ..	67·7	4·7	55·5	23·5	30·00
Hookworm ..	59·0	1·7	78·8	35·3	20·0
Oxyuris ..	22·4	0·6	17·1	6·0	9·0

TABLE I.

Showing Incidences and Causes of Death in Different Groups

Causes of deaths	Christian Filipinos above 1 year of age		Christian Filipino infants 1 year or under		Moros		Chinese		Americans		Japanese		Others	
	No cases	Per cent	No cases	Per cent	No cases	Per cent	No cases	Per cent	No cases	Per cent	No cases	Per cent	No cases	Per cent
Respiratory	147	29.4	64	28.3	5	12.2	33	8.8	1	7.1	2	22.2		
Intestinal	105	21.0	34	15.0	4	9.8	8	23.5			2	22.2		
Cardiac	61	12.2	95	42.0	6	14.6	4	11.7	(a)6	43.0			Spaniard 1	.
Nervous	42	8.4	17	5.3	1	2.4	2	5.8	1	7.1				.
Blood	13	2.6			2	4.9	1	2.9	1	7.1	3	33.3	Norwegian 1	
Reproductive (fem.)	30	6.0												
Urinary	16	3.2							1	7.1				
Malig. tumour	27	5.4	1	0.44	1	2.4	3	8.8	1	7.1	1	11.1	Spaniard 1	.
Violence	46	9.2	1	0.44	21	51.2	9	26.5	3	21.4			Spaniard 1 Argentine 1 Malayan 1	. . .
Others	13	2.6	19	8.4	1	2.4	4	11.7			1	11.1		
TOTALS	500		(b)226		41		34		14		9		6	.

Total cases used in computation 830
(a) One case of infantile beri beri in an American Filipino infant included
(b) Stillborn Christian Filipinos 5

helpless, Manila, at the opening of the seventeenth century, was far in advance of any city in the English colonies for more than a century and a half to come. Such is the conclusion arrived at by an American scholar after a comparative study of Spanish and English colonies.'

(4) As Legaspi was the first Spaniard to make a permanent settlement in the Philippine Islands (1565), he was, of course, the first to devise laws for the protection of public health. He adopted a sanitary code, inspired by the spirit of the Laws of the Indies, which included matters of health and sanitation. In charge of the Franciscans, Legaspi established a public dispensary, which later became the San Juan de Dios Hospital. This hospital is still existing. In 1632, another hospital was built exclusively for the natives. This is now called the San Lazaro Hospital. During the same century, other hospitals were erected in the provinces by the same order. The first special leper institution was established in Manila in 1631 by the Franciscan Order.

(5) General Francisco Carriedo y Peredo, a former Governor-General of the Philippine Islands, in a will executed in December 1733, bequeathed the sum of Pesos 10,000·00 to the city and commercial interests of Manila for the establishment of a waterworks, the only condition exacted being that the poor shall be benefited by it. As nothing came out of the above offer, he again bequeathed, in a will dated 27th July, 1743, the amount of Pesos 10,000·00 for the same purpose, with the stipulation that the convent of San Francisco, the San Juan de Dios Hospital and the Monastery of Santa Clara shall receive free water on contributing to the cost of the works. The Municipal Board decided not to utilize this money at once, and invested it in merchandise of the annual galleons, which carried eastwards to Acapulco, all the products of the Orient. The investment proved so profitable that in 1762 the amount available was nearly Pesos 250,000·00. During the English occupation of Manila, however, the Carriedo funds were raided and nothing was left except what was invested in the galleon trade. In 1867, the Carriedo funds amounted to Pesos 177,853·44. In 1869, during Gandara's administration the project was again considered. The system was designed by Don Genaro de Palacios y Guerra, a Civil Engineer of the Royal Corps of Engineers in the Spanish Army, who started his investigation in December 1869. On 23rd January, 1878, the first stone of the work was put in place. The work was completed and officially inaugurated on 21st to 25th July, 1882.

In 1784, the Spanish Government took possession of the San Lazaro estate, which was turned over to the Franciscans for the establishment of a leper institution, with the understanding that a portion thereof was to be used as site for the hospital and the remaining part would be leased. The revenue received therefrom were devoted to the support of the lepers.

(6) In 1805, the Bureau of Vaccination was created, and rules and regulations regarding the distribution and preservation of vaccine virus were prepared by the Central Board of Vaccination in 1806. On 23rd June, 1813, an order was issued creating a Board of Health for the City of Manila. In 1851, two physicians were

HISTORICAL REVIEW OF HEALTH ACTIVITIES IN THE PHILIPPINE ISLANDS.

BY

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(1) THE most important event in the early part of the sixteenth century was the discovery of the Philippine Islands by the Spaniards This third great geographical discovery was made by Magellan when he sailed across the Pacific Ocean from San Lucar de Barrameda, Spain, on 10th August, 1519 On 16th March, 1521, Ferdinand Magellan landed on Philippine soil, and the Spaniards made the first deal with Filipinos on 18th March, 1521

(2) In attempting to discuss something about health activities in the Philippines during the early part of Spanish domination, we have to bear in mind that the only sources of data are the Friar chronicles, especially that of the Franciscans.

(3) The main purposes of Spanish colonization were three First, and above all other considerations, the religious conversion of the natives, second, commerce, and third, political aggrandizement Charitable institutions were founded by the missionaries, who were, according to the testimony of all writers, imbued with a deep spirit of self sacrifice The first civil hospital was established by Governor Francisco de Sande (1575—1580) For the expense of this hospital, he assigned the tribute of about ' one thousand Indians ' (natives) Later, during the governorship of Morga (1595-1596), there were three hospitals, two for Spaniards and one for Filipinos In 1603, the first general hospital for all kinds of disease was constructed by the Franciscan Order. In a report presented in 1618, we learned that other hospitals had been established in the provinces Says an official report: ' The hospitals which your Majesty has in the Philippine Islands are: the Royal Hospital where soldiers are treated, another in Cavite where sailors are treated; another for the Indian natives conducted by the Franciscan Friars, another for the Sangleys, by the Dominican Friars, another by La Misericordia for the Mestizos, another at the Hot Springs in Los Baños by the Franciscan Friars, another in Cagayan, another in Cebu, another in Maluco, and another for the convalescents, by the friars who are coming back from the Indias The orphanages of San Andres and Santa Potenciana in Manila are two other charity institutions where shelter is given to the needy women and girls of the city. In provi[illegible]

(10) After the American occupation on 13th August, 1898, General McArthur, looking over the sanitary situation and seeing the data available at the time not complete and reliable, became convinced of the imperative necessity of drafting a new sanitary organization.

(11) General Order No. 16, dated Head-quarters of the Department of the Pacific and Eighth Army Corps, Manila, P. I., 10th September, 1898, assembled a new Board of Health for the City of Manila. The Board was formally organized by General Order No. 15, dated Head-quarters of the Provost Marshall-General, Manila, P. I., 29th September, 1898. The new board was composed of five members, with two Filipinos as honorary members.

(12) The first rules and regulations of this Board were issued on 18th October, 1898. One of the most important problems that the newly organized board was called upon to deal with, states a report, was that of the epidemic of smallpox. The old Spanish vaccine farm was re-established, and a corps of city vaccinators put to work. Eighty thousand people in the City of Manila had been vaccinated during that fiscal year, 82 per cent of the vaccinations being successful. In the meantime, a smallpox hospital, a leper hospital and a hospital for the treatment of venereal diseases had been established. A veterinary corps was also organized.

(13) On 26th August, 1899, the Provisional Board of Health was abolished, and in its stead the office of the Commissioner of Public Health was created. A bacteriological department was then added to the municipal laboratory which was conducted by the former Board of Health. A plague hospital was also established. The registration of births, marriages and deaths, which heretofore had been in charge of the parochial priests, was established. A municipal dispensary was organized, and the work of protecting the City against smallpox, so successfully inaugurated, was continued.

(14) On 1st September, 1900, the United States-Philippine Commission arrived in the Islands, and in the exercise of its legislative power, a power heretofore entrusted to the military governor, enacted a law (Act No. 62) on 21st December, 1 00, authorizing the Provost Marshall-General to establish police and health regulations in the form of municipal ordinances for the City of Manila. Matters which had heretofore been governed by rules and regulations were then embodied in ordinances and enforced by the military authorities.

(15) The first health ordinance was promulgated on 6th April, 1901. This ordinance, which included nearly every phase of municipal sanitation, has been the foundation of all subsequent ordinances and of the Sanitary Code. It provided, among other things, that every physician called to visit or examine any case of infectious or contagious disease should immediately cause such patient to be promptly isolated and notice given to the health authorities. Another important section was the compulsory vaccination clause, which made it the duty of every person in Manila to be successfully vaccinated at intervals of one year, and provided that every person who had been exposed to the infection of

appointed to make visits to the indigent people and advise them how to preserve their health On 5th November 1851 this Board was abolished On November of the following year, the first maritime quarantine law was enacted which law was later amended in the year 1860 Boats coming from foreign ports were inspected and bills of health were issued During the term of Governor General Norzagaray (1857—1860), general sanitary improvements were introduced in Manila The Botanical garden was established public highways constructed parks laid out the filling of lowlands effected and sub surface sewers built In 1863 the provincial and municipal authorities were given instructions to co operate with the health officers on matters regarding public health such as housing water supply, factory, market conditions etc Laws regarding public health were passed In 1870, provincial and municipal boards of health were established in regularly organized towns The importance of the sewage problem although sanitary service in those days was practically nil was recognized as revealed by the Royal Decree dated 30th August 1882 approving the classification of estero of the City of Manila Major D Carlos de las Heras of the Royal Corps of Engineers had a project, which was used as basis for classification of a combined sewer system to discharge along the Pasig River, and a system of underground sewers built of rectangular blocks of adobe stones within the Walled City and a small part of the commercial section on the north side of the Pasig River

(7) In 1875 the University of Santo Tomas which was founded in April 1611, turned over its first medical graduates For the first time the positions of health officers the so called 'medicos titulares' were created on 31st March 1876 In 1883, the Superior Board of Health was organized In 1888 the office of Medical Inspector of Health and Charity for the entire archipelago was created the 'medicos titulares' being the chief health officers Besides vaccinators were appointed

(8) In 1892, the position of legal physician was created From this period, public health activities were entrusted to a dependency of the Bureau of Civil Administration This dependency was the office of the General Inspector of Health and Charity, composed of one general inspector and one administrative officer, with an advisory body

(9) The production of vaccine virus was entrusted to the Central Institute of Vaccination which was composed of the following personnel His Excellency the Governor General, Chairman His Grace the Archbishop of Manila the Lord Mayor of the City, the City Attorney, the Provincials of the [illegible], Franciscan Dominican and Recollect Orders, the Chief Physician of the Institute and Assistant Chief as Secretary The specific duty of the Central Institute was to preserve and propagate the virus The virus was [illegible] arm to arm [illegible] nine days among susceptible children, later in [illegible] To preserve the virus in a more or less natural state, it was placed between two pieces of [illegible] inch square, and sealed with paraffin or wax, or [illegible] tubes [illegible] this state, transported to the provinces

(19) This legislation conferred ample powers on the Director of Health, who, with the approval of the Secretary of the Interior, may suspend, modify or annul any ordinance, regulation or order enacted or promulgated by local boards of health, municipal councils, and any local or municipal official in the exercise of his authority in matters of sanitation, when, in the opinion of said Director, such ordinance, regulation or order is detrimental to the interests of the public health. The hospitals and sanatorium operated by the government were merged with the Bureau of Health as a division thereof. The Bureau of Health was also charged with the duty of caring for the health of prisoners and the control and supervision of the sanitation of all insular, provincial and municipal prisons. The veterinary division of the Board of Health was transferred to the Bureau of Agriculture. The Quarantine Service, to be administered under the direction of the United States Public Health and Marine Hospital Service, and to have such officers with duties and powers as prescribed by law of Quarantine Service, was also created.

(20) On 21st February, 1906, the legislation (Act 1458) regulating the establishment and maintenance of burial grounds and cemeteries was approved.

(21) On 1st July, 1906, another important legislation (Act 1487), enacted on 16th May, 1906, took effect. It abolished the Provincial Boards of Health, substituting for them district health officers and defining their powers and duties. This act provided, among other things, that each province may have a district health officer who is to be appointed by the Governor-General, with the advice and consent of the Philippine Commission.

(22) On 20th October, 1906, the Sanitary Code for the City of Manila, now incorporated in the 'Revised Ordinances,' was enacted to take effect on 1st January, 1907. The construction of the sanitary sewer was begun in 1906 and the first connection to the houses was made in 1909. On 14th March, 1907, the district health officer was authorized (Act 1613) to organize, with the approval of the Director of Health, two or more neighbouring municipalities into a municipal health district, and such municipalities composing a district may employ jointly a president of the municipal health district.

(23) On 10th January, 1907, the Philippine Medical School was opened. On 18th May, 1907, the pure food and drugs law (Act 1655) was enacted for the purpose of preventing the manufacture, sale, or transportation of adulterated or misbranded foods, drugs, medicines and liquor, and also regulating its traffic. On 8th July, 1907, the trustees of asylum and other institutions where poor children were maintained at public expense were authorized (Act 1670) to place such children in charge of suitable persons. The law also provides for the adoption of such children. On 6th August, 1907, Act (1677), providing anatomical material for the advancement of medical science, was passed.

(24) Following this, on 12th September, 1907, came another important legislation (Act 1711). This provides for the apprehension, detention, segregation and treatment of lepers in the Philippine Islands. On 18th June, 1908, the University of the Philippines was founded (Act 1870), and the Philippine Medical School was

smallpox including varioloid, should be successfully vaccinated or revaccinated a sufficient number of times, at intervals of two weeks, to render it evident that successful vaccination was impossible It also provided for the compulsory registration of births, deaths and marriages, the disposal of the dead, cleaning of septic vaults, abatement of nuisances, plumbing and house drainage, practice of medicine and dentistry, and others

(16) On 1st July, 1901, Act No 157, providing for the establishment of a Board of Health for the Philippine Islands, was approved, and all employees of the Manila Board of Health were transferred to this Board by subsequent legislation (Act 187) passed on 5th August, 1901, for efficiency and economy The law provided that the Board of Health for the Philippine Islands should also act as the Board of Health for the City of Manila On 6th August, 1901, a legislation (Act 189), providing medical attendance for civil officers and employees and their families, was enacted, and on 1st October a Civil Hospital, mainly for civil employees, was established (Act 247)

(17) The next legislation was passed on 2nd December, 1901 (Acts 307, 308 and 309), establishing the provincial and municipal boards of health This completed the health organization in accordance with the political division of the Philippines, viz, insular, provincial and municipal organizations Compulsory vaccination, which had been enforced in Manila since the organization of the health service, was made applicable throughout the provinces, and it was provided that every person living in the Philippine Islands shall submit to vaccination as often as the health authorities may deem necessary, unless satisfactory evidence is produced stating that he is immune from smallpox. On 14th July, 1902, a temporary provision (Act 429) was made for the care of invalid civil service employees at Baguio, pending the establishment of a government sanatorium

(18) The next important health legislation (Act 310), enacted on 24th December, 1901, was the regulation of the practice of medicine and surgery in the Philippine Islands. This legislation was supplemented on 10th to 26th January, 1903 (Acts 593 and 597), regulating the practice of dentistry and pharmacy On 1st January, 1902, the Committee on selection submitted its report recommending the Culion Islands as a site for a leper colony. The establishment of this leper colony was made in January of 1903, and the segregation of lepers commenced in May 1906 The Board of Health was authorized (Act 130) on 4th May, 1905, to promulgate quarantine regulations for all vessels engaged in the coastwise trade, for those entering ports of the Philippine Islands, except ports of entry, and fixing penalties for violation thereof. The Board of Health extended its operation to every municipality in the archipelago and conducted its work until changed into the Bureau of Health on 20th October, 1905, by the 'Re organization Act.' The Bureau of Health, by this act, was placed under the Department of the Interior, and the Director of Health was made the legal successor of the Board of Health in the Philippine Islands, abolishing the post of Commissioner of Public Health who was the executive officer of the Board.

(19) This legislation conferred ample powers on the Director of Health, who, with the approval of the Secretary of the Interior, may suspend, modify or annul any ordinance, regulation or order enacted or promulgated by local boards of health, municipal councils, and any local or municipal official in the exercise of his authority in matters of sanitation, when, in the opinion of said Director, such ordinance, regulation or order is detrimental to the interests of the public health. The hospitals and sanatorium operated by the government were merged with the Bureau of Health as a division thereof. The Bureau of Health was also charged with the duty of caring for the health of prisoners and the control and supervision of the sanitation of all insular, provincial and municipal prisons. The veterinary division of the Board of Health was transferred to the Bureau of Agriculture. The Quarantine Service, to be administered under the direction of the United States Public Health and Marine Hospital Service, and to have such officers with duties and powers as prescribed by law of Quarantine Service, was also created.

(20) On 21st February, 1906, the legislation (Act 1458) regulating the establishment and maintenance of burial grounds and cemeteries was approved.

(21) On 1st July, 1906, another important legislation (Act 1487), enacted on 16th May, 1906, took effect. It abolished the Provincial Boards of Health, substituting for them district health officers and defining their powers and duties. This act provided, among other things, that each province may have a district health officer who is to be appointed by the Governor-General, with the advice and consent of the Philippine Commission.

(22) On 20th October, 1906, the Sanitary Code for the City of Manila, now incorporated in the 'Revised Ordinances,' was enacted to take effect on 1st January, 1907. The construction of the sanitary sewer was begun in 1906 and the first connection to the houses was made in 1909. On 14th March, 1907, the district health officer was authorized (Act 1613) to organize, with the approval of the Director of Health, two or more neighbouring municipalities into a municipal health district, and such municipalities composing a district may employ jointly a president of the municipal health district.

(23) On 10th January, 1907, the Philippine Medical School was opened. On 18th May, 1907, the pure food and drugs law (Act 1655) was enacted for the purpose of preventing the manufacture, sale, or transportation of adulterated or misbranded foods, drugs, medicines and liquor, and also regulating its traffic. On 8th July, 1907, the trustees of asylum and other institutions where poor children were maintained at public expense were authorized (Act 1670) to place such children in charge of suitable persons. The law also provides for the adoption of such children. On 6th August, 1907, Act (1677), providing anatomical material for the advancement of medical science, was passed.

(24) Following this, on 12th September, 1907, came another important legislation (Act 1711). This provides for the apprehension, detention, segregation and treatment of lepers in the Philippine Islands. On 18th June, 1908, the University of the Philippines was founded (Act 1870), and the Philippine Medical School was

merged and became the College of Medicine and Surgery of the University of the Philippines On 20th May, 1909, Pesos 20,000 00 were appropriated (Act 1931) for the establishment of training classes for the nursing profession Said instruction was given in the Philippine Normal School under the direction of the Director *of Education, supplemented by practical nursing in such hospital or hospitals as* the Director of Education may designate The first selection of those who are to take the nursing course was made by the Division Superintendents of Schools from among the female students in the municipalities of their respective provinces Twenty students were the maximum number allowed for the first year This legislation was repealed (Act 1975) on 18th April, 1910, by transferring the control from the Director of Education to the Director of Health Further amendment (Act 2161) was made on 6th February, 1912, by removing the restrictions as to the *number of applicants of each sex that may be admitted during any one year*

(25) Pursuant to the provisions of the law of the United States Congress, known as 'Bill Payne,' the regulations of the Bureau of Health for the sanitary control of tobacco products were first promulgated on 2nd December, 1909, later rules were laid down, on 1st April, and 27th October, 1910, and 8th August, 1921 The Philippine Islands Anti-tuberculosis Society was organized on 29th July 1910 On 10th September, 1910, the Philippine General Hospital was officially inaugurated.

(26) On 1st February, 1912, a committee was created (Act 2116) to investigate the cause of the excessive infant mortality in the Philippine Islands and the measures which should be adopted to decrease it and appropriated for this purpose the sum of Pesos 10,000 00. The time allowed the committee for the accomplishment of its work was extended (Act 2216) on 11th February, 1913, and a further appropriation of Pesos 20,000 00 was made for the expenditure of the committee The report of this committee, which cost Pesos 6,525 00 was published in Spanish and English On the same date, 1st February, 1912, a legislation (Act 2122) was enacted providing for the confinement of insane persons in government hospitals or other institutions for the insane, and the appointment of a board of physicians to inquire into the mental conditions of persons alleged to be insane

(27) The first step for a permanent legislation was made on 6th February, 1912 (Act 2156), by the Philippine Assembly, authorizing the consolidation of municipalities *into sanitary divisions, and providing for* each province a special fund to be known as 'Health Fund,' and defining the powers and duties of the presidents of sanitary divisions who were thereafter to be appointed by the Director of Health On the same date, funds were appropriated (Act 2147) for charitable purposes Pesos 50 000 00 for the control of tuberculosis by the anti tuberculosis Society, Pesos 12,000 00 for the protection of infants, through the institution La Gota de Leche, and Pesos 8,000 00 for the Mary J. Johnson Hospital

(28) On 1st February, 1913, a law (Act 2212) was passed providing that the number of municipalities in a sanitary division shall not exceed *four* On 23rd October, 1913, the Philippine Assembly, in its resolution No. 51, created a

committee to investigate, study and submit the necessary recommendations for the proper reform and improvement of the Health Service and its branches, including the General Hospital, the Bureau of Science and the College of Medicine and Pharmacy of the University of the Philippines. The report of this committee was submitted on 6th January, 1914.

(29) The first manual of the Bureau of Health for the Philippine Islands was published in 1911, and the handbook for sanitary inspectors, in 1913. During the same year, the first draft of the Provincial Sanitary Code was drawn.

(30) On 4th February, 1915, the legislation (Act 2461) for the prevention of hydrophobia or rabies was passed. It gave power to the Director of Health to declare the existence of rabies in any locality, and his notice and its provisions shall have the same legal effect as a sanitary regulation, and provided punishment for violators.

(31) In 1914, when the Civil Government was inaugurated in Mindanao and Sulu, a Public Health Service was also established in that region, in charge of one health officer. This Service was independent of the main organization, and the chief thereof had almost the same power as the Director of Health within his territory. This Service was later merged with one of the divisions of the main organization.

(32) The first clean-up-week celebration was inaugurated in 1914 upon the initiative of the Director of the Bureau of Education, and held from the 14th to the 20th day of the month of December. The public schools were made responsible for its success.

(33) On 5th February, 1915, a Public Welfare Board was created (Act 2510) for the purpose of co-ordinating the efforts of all government agencies and private organizations receiving financial aid, interested in public welfare or social service work.

(34) The most far reaching re-organization of the Bureau of Health was made on 5th February, 1915 (Act 2468). The Bureau of Health was changed into Philippine Health Service, and this took effect on 1st July of the same year. In addition to the statutory provisions, it provided for the creation of a Council of Hygiene and several divisions and offices, including those of the assistant director of health and the sanitary engineer, made the tenure of office of the Director of Health four years, and regulated the transfer, promotion and commission, of all physicians of the former Bureau of Health. The sanitary commission was instituted in 1916, as well as child hygiene activities. On 23rd February 1916, the amount of Pesos 1,000,000·00 was appropriated (Act 2633) for the protection of early infancy and the establishment of 'Gota de Leche,' a charitable public institution with the same aim and purpose. On 24th February of the same year, all sanitary laws were codified and included in the Administrative Code of the Philippine Islands (Act 2657), restricting certain powers and privileges of health officers. This Code was revised on 10th March, 1917, without any substantial change (Act 2711).

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(28) On 1st February 1913 a law (Act 2232) was passed providing that the number of municipalities in a sanitary division shall not exceed four On 23rd October, 1913 the Philippine Assembly, in its resolution No 51, created a

to the Division of Provincial Sanitation, with the only difference that the jurisdictional area of the provincial division covers the whole territory of the Philippine Islands, except the city of Manila, with ample jurisdiction over the local funds allotted for municipal and rural sanitation. Outside of the city of Manila, the chief of the Division of Provincial Sanitation, therefore, is directly responsible for all the sanitation work that is being done in the entire Philippine Islands. The Office of Vital Statistics is charged with the procurement and maintenance of vital statistics, handling of burial and exhumation permits, and conduction of statistical researches ; the Office of the Executive Officer, which sees that the announced policies and instructions of the Director of Health are properly carried out, co-ordinates the work of all divisions and offices to ensure maximum efficiency, and handles all matters relating to organization and personnel ; the Office of General Inspection inspects, investigates and reports upon the sanitary conditions, general administration and all complaints that may be referred to it, and exercises supervision over the activities on public health nursing, school medical inspection and industrial hygiene ; the Office of Property handles all matters relating to maintenance and supply of property ; the Office of Records and Finance takes charge of all financial matters and maintains all records and files.

(39) There are also various sections ; to wit : Section of Public Health Nursing, Section on Malaria Control, Leprosy Section, Section on Vaccination, Section of Industrial Hygiene, Section on Education and Publicity, and License Section. All these agencies function under the direction of the Director of Health, who exercises general supervision and control over all matters pertaining to the Philippine Health Service and is responsible for the efficient management of its affairs. The chiefs of divisions and offices are the administrative agents of the Director of Health and function under powers delegated by him. They are endowed with authority, under the control of the Director of Health, and in his name and under such regulations as the Director may prescribe, to conduct the routine affairs of the offices of which they are in charge and to carry out all necessary details pertaining thereto.

(40) In addition to the general appropriation of the Insular Government, the Philippine Health Service is further supported by the provincial health fund constituted by the aid given by the provinces and municipalities, which aid is fixed at not less than five per centum of their general net income. The provincial health fund is only expended for the benefit of the province to which it belongs. Most of this money goes to salaries of the subordinate personnel, travelling expenses and the purchase of medicines and medical supplies. Actually the Insular Government and the local governments spent, through the Philippine Health Service, approximately Pes 0·43 *per capita*, for sanitation, hygiene and hospitalization, which is just about one-fifth of that expended for public education.

(41) For purposes of health administration, each province in the Philippines is organized into a health district administered by one district health officer, who is a duly qualified physician. The district health officer is the representative of the Director of Health in the province where he is assigned, and is charged with the

TO THE DIRECTOR OF HEALTH

Section on Malaria Control

DIVISION OF P MUNICABLE DISEASES

Supervision and c of public health and agencies f r the pr rol of communicable disease provinces includ ng t the nature of disease and hospitals dispensaries

popular literature
paigns and clinics
ccinators and inoculators

DIVISION OF SANITARY ENGINEERING

Building inspection and permits
Plumbing inspection and permits.
Complaints and Court cases
Sanitary appliances
Planning and drafting
Consultant in provincial sanitary problems
Fly, mosquito and rat eradication

OFFICE CORDS AND FINANCE.

Han dles all matters ndence supply of property and files ancial matters.

OFFICE OF VITAL STATISTICS.

Maintains vital statis ics
Handles burial and exhumation permits
Conducts statistical research

Year.		Christian population.	Christian and non-Christian population.
1916	..	9,006,312	9,896,074
1917	..	9,156,332	10,063,366
1918	..	9,306,360	10,230,661
1919	..	9,453 372	10,398,029
1920	..	9,606,392	10,566,049
1921	..	9,756,411	10,734,053
1922	..	9,906,440	10,902,081
1923	..	10,056,457	11,070,306
1924	..	10,206,480	11,238,593
1925	..	10,356,502	11,406,875
1926	..	10,506,525	11,575,176
1927	..	10,656,545	11,744,172

Appendix B.

*...th, birth and infant mortality rates in the Philippine Islands.**

	Estimated Christian population as of 1st July.	Deaths. †	Death rate per 1,000 population.	Births. †	Birth rate per 1,000 population.	Infant mortality.	Infant mortality rate per 1,000 births.
.	5,524,875	146,921	26·59	216,687	39·11	48,492	224·40
.	6,063,945	168,555	27·46	244,514	40·32	49,060	200·65
.	6,119,408	143,284	23·57	214,465	35·05	41,045	191·38
.	6,500,586	138,464	21·29	263,061	40·47	43,928	166·98
.	6,519,845	190,495	29·08	244,933	37·39	49,023	200·14
.	6,949,191	179,355	25·80	263,502	37·92	51,406	195·08
.	31,182,975	818,153	26·24	1,230,475	39·46	234,462	190·545
.	6,236,595	163,631	..	246,095	..	46,883	..

...ation, number of deaths, births and deaths of children under one year are based to ...l municipalities which have submitted the report.

...irths not included.

protection of the health of the people thereof and the maintenance of sanitary conditions therein. He has the power to institute all proceedings necessary to abate nuisances, cause the prosecution of all violations of health laws and ordinances, and remove the cause of any special disease or mortality. Practically all health districts are organized into sanitary divisions in each of which is assigned a qualified physician appointed by the Director of Health as president with practically the same powers of the district health officer subject to the immediate control and supervision of the latter. If funds are insufficient or the services of physicians are not available registered male nurses and others with a knowledge in sanitation and hygiene are appointed. District health officers and presidents of sanitary divisions have assistant sanitary inspectors and sometimes district nurses also. The registration of births marriages and deaths is in the charge of the municipal secretary, who is appointed by the municipal president and whose salary is paid from the municipal general fund. With the exception of the presidents of sanitary divisions, all medical officers in the Philippine Health Service are commissioned by the Governor General after they have passed the required civil service examination. Persons possessing special qualifications are sometimes commissioned and given original appointment without taking any civil service examination. There are four grades in the commissioned service each of which may be obtained after passing the examination required for the grade. The salaries of commissioned officers are fixed by law according to their rank and are payable from the Insular fund.

Appendix A

Estimated population of the Philippine Islands from 1903 to 1927 as of 1st July

Year	Christian population	Christian and non Christian population
1903	7 056 031	7 721 [illegible]
1904	7 206 054	7 888,[illegible]
1905	7 356,077	8 055 885
1906	7 506,105	8 [illegible]3,14[illegible]
1907	7 656 11[illegible]	8 3[illegible] 441
1908	7 806 147	[illegible]
1909	7 956,1[illegible]	[illegible]
1910	8 106,188	[illegible]
1911	[illegible]	[illegible]
1912	[illegible]	[illegible]
1913	[illegible]	[illegible]
1914	[illegible]	[illegible]
1915	[illegible]	[illegible]

Appendix C.

Population, deaths, births with rates per 1,000 population. Infant mortality and infant mortality rate per 1,000 births for the city of Manila, from 1900 to 1926.

Year.		Estimated population.	Deaths. (1)	Death rate per 1,000 popula-tion.	Births. (2)	Birth rate per 1,000 popula-tion.	Infant mortality.	Infant mortality rate per 1,000 births.
1900	..	208,938	(*a*)10,443	49·98	..	..	..	..
1901	..	213,066	(*b*)9,375	44·00	4,900	23·00	..	..
1902	..	217,194	14,451	66·53	2,801	12·90	..	..
1903	..	221,322	9,358	42·28	4,321	19·52	..	..
1904	..	225,450	10,301	45·69	7,527	33·38	6,107	811·35
1905	..	229,578	8,741	38·08	8,018	31·92	4,179	521·20
1906	..	233,706	9,182	39·29	7,783	33·30	3,706	476·17
1907	..	237,834	7,287	30·64	7,899	33·21	3,104	392·96
1908	..	241,962	10,646	44·00	8,732	36·09	4,960	568·03
1909	..	246,090	7,936	32·25	8,776	35·66	3,894	443·71
Total	..	1,189,170	43,792	..	41,208	..	19,843	..
and Average	..	237,834	8,754	36·83	8,242	34·65	3,969	481·53
1910	..	250,218	8,029	32·09	9,694	38·74	4,279	441·41
1911	..	254,346	8,227	32·35	9,330	36·68	3,987	427·33
1912	..	258,474	7,819	30·25	9,142	35·37	3,597	393·46
1913	..	262,602	5,904	22·48	8,695	33·11	2,908	334·45
1914	..	266,730	6,587	24·70	9,599	35·99	3,325	346·39
Total	..	1,292,370	36,557	..	46,460	..	18,096	..
and Average	..	258,474	7,311	28·29	9,292	35·95	3,619	389·50
1915	..	270,858	6,820	25·18	8,850	32·67	3,511	396·72
1916	..	274,986	7,165	26·06	9,082	33·03	3,059	336·82
1917	..	279,114	6,682	23·94	8,883	31·83	2,447	275·47
1918	..	283,242	12,369	43·67	9,083	32·07	3,611	397·56
1919	..	287,370	7,814	27·19	10,029	34·90	2,256	224·95
Total	..	1,395,570	40,850	..	45,927	..	14,884	..
and Average	..	279,114	8,170	29·27	9,185	32·91	2,977	324·08
1920	..	291,498	7,667	26·30	12,614	43·27	2,687	213·02
1921	..	295,626	7,537	25·50	12,261	41·47	2,871	234·16
1922	..	299,754	7,221	24·09	13,092	43·68	2,543	194·24
1923	..	303,882	7,903	26·01	14,598	49·22	2,804	187·46
1924	..	308,010	8,297	26·94	13,969	45·35	2,733	195·65
Total	..	1,498,770	38,625	..	66,894	..	13,638	..
and Average	..	299,754	7,725	25·77	13,379	44·63	2,727	203·87
1925	..	312,138	7,450	23·87	15,046	48·20	2,513	167·02
1926	..	316,266	8,340	26·37	14,813	46·84	2,463	166·35

(1) Among residents only, still-births excluded, unless otherwise stated.
(2) Registration incomplete.
(*a*) Including transients and still-births (as per data available).
b From January to June including transients and still-births, from July to November, only transients included, December residents only.

APPENDIX B—*concld*

Year.	Estimated Christian population as of 1st July	Deaths †	Death rate per 1,000 population	Births †	Birth rate per 1,000 population	Infant mortality	Infant mortality rate per 1,000 births
1910 ..	7,645,774	191,586	25·08	239,647	31·34	49,260	205·55
1911	7,825,505	188,412	24·07	302,594	35·67	58,744	194·13
1912	7,960,497	185,185	23·26	290,884	36·54	53,966	182·08
1913	8,166,201	154,094	18·82	303,907	37·12	46,472	152·91
1914	8,324,054	163,947	19·69	345,324	41·49	54,835	158·79
TOTAL AND AVERAGE .	39,912,031 7,980,406	883,224 176,645	22·11	1,482,356 296,506	37·11 .	263,277 52,656	213·963
1915	8,461,900	176,319	20·94	326,705	38·61	57,873	177·14
1916	8,769,035	190,430	21·71	308,593	35·19	57,297	185·66
1917	9,041,737	209,415	23·16	350,002	38·71	64,986	185·65
1918	9,187,759	360,980	35·28	341,333	37·15	89,625	262·28
1919	9,333,265	325,706	34·89	308,304	33·03	72,593	235·46
TOTAL AND AVERAGE ..	44,794,196 8,958,839	1,262,880 252,576	28·19 .	1,634,938 326,987	36·50	342,374 68,475	209·41
1920	9,549,551	201,384	21·08	338,120	35·24	56,834	169·53
1921 .	9,707,183	204,528	21·06	343,287	35·36	60,711	176·85
1922	9,805,338	200,891	20·49	351,632	35·86	57,225	161·31
1923 .	10,056,457	204,066	20·29	385,778	38·26	56,904	147·50
1924 ..	10,206,480	228,554	22·35	381,432	37·37	61,436	161·09
TOTAL AND AVERAGE ..	49,325,009 9,865,001	1,039,423 207,884	21·07 ..	1,800,249 360,050	36·50 ..	293,110 58,622	162·816 ..
1925 .	10,356,502	206,457	19·94	387,568	37·42	58,204	150·15
1926 .	10,506,525	230,011	21·89	400,488	38·12	62,770	156·74

* Population, number of deaths, births and deaths of children under one year are based to provinces and municipalities which have submitted the report.

† Still-births not included

APPENDIX D—*concld.*

Year.	Population.*	Smallpox.		Measles.		Whooping-cough.	
		Number.	Rates.	Number.	Rates.	Number.	Rates.
1906 ..	5,061,377	4,051	80·01	374	7·39	1,636	32·31
1907 ..	6,405,634	3,026	47·24	727	11·35	1,920	29·97
1908 ..	6,436,420	8,734	135·64	1,074	16·69	1,810	28·11
1909 ..	6,610,204	6,237	91·56	766	11·24	1,756	25·73
1910 ..	7,328,481	3,044	41·52	467	6·37	2,011	27·47
1911 ..	7,613,375	1,192	15·65	506	6·64	2,721	35·72
1912 ..	7,817,126	567	7·22	1,937	24·68	2,050	26·12
1913 ..	8,067,981	903	11·19	1,394	17·27	2,154	26·69
1914 ..	8,315,129	438	5·33	418	5·00	1,570	19·11
1915 ..	8,353,013	276	3·30	608	7·28	2,039	24·41
1916 ..	8,492,407	610	7·18	802	9·44	2,087	24·56
1917 ..	9,149,901	436	4·77	1,025	11·20	2,344	25·62
1918 ..	9,314,445	16,147	173·42	960	10·31	2,673	28·71
1919 ..	9,478,929	49,971	527·19	314	3·31	1,616	17·05
1920 ..	9,627,450	6,632	68·91	848	8·81	1,289	13·39
1921 ..	10,081,267	728	7·22	3,338	33·11	1,980	19·64
1922 ..	10,547,349	19	0·18	1,017	9·64	2,184	20·71
1923 ..	11,067,117	4	0·04	536	4·84	995	8·99
1924 ..	11,234,415	1	0·009	773	6·73	1,893	12·90
1925 ..	11,401,708	1	0·009	423	3·710	1,120	9·323
1926 ..	11,568,994	6	0·052	2,907	25·127	1,372	11·859

* Summation of Christian and non-Christian population of provinces reporting cases.

Appendix D.

Total deaths from certain causes, with death rates per 100,000 population in the Philippines

Year	Population *	Cholera		Dysentery		Typhoid	
		Number	Rates	Number	Rates	Number	Rates
1906 .	5,061,377	6,067	119 86	8,812	174 10	2,349	46 39
1907	6,105,634	718	11 20	8,782	137 09	2,344	36 59
1908	6,436,420	17,770	276 08	12,215	189 77	2 582	40 10
1909	6,610,204	8,566	125 78	13,703	201 21	2,689	39 47
1910	7,328,481	7,202	99 50	18,295	249 64	2,689	33 47
1911	7,613,375	124	1 64	18,379	217 97	2,141	28 11
1912	7,817,126	0	0	20,302	258 72	2,391	30 46
1913	8,067,981	186	2 31	7 985	98 97	2 341	29 00
1914	8,315,129	2,347	28 57	6,702	81 58	2,464	29 63
1915	8 353,013	398	4 76	8,015	95 95	2,196	26 29
1916	8,492,407	8,235	96 97	7,755	91 32	2,593	30 53
1917	9,149,901	8,723	95 33	9,310	101 76	3 550	38 80
1918	9,314,445	5,924	63 60	11,360	121 96	4,395	47 20
1919	9,478,924	18,213	192 14	19,196	208 40	3,810	40 20
1920	9,627,450	1,194	12 40	9,196	95 52	2,848	29 58
1921	10,081,267	47	0 46	9,381	93 05	2,571	25 50
1922	10,547,349	72	0 68	7,913	75 02	2 029	19 24
1923	11,067,117	11	0·10	7,064	63 83	2,001	18 08
1924	11,231,445	26	0·23	8,460	73 70	1,922	16 77
1925 .	11,401,708	588	5 157	4,925	43 293	1,810	15 87
1926 ..	11,558,994	238	2 057	9,333	80 724	1,503	12·992

* Summation of Christian and non Christian population of provinces reporting cases

APPENDIX E—*concld.*

Year.	Population.*	TB—OTHER ORGANS.		MALARIA.		BERI-BERI.	
		Number.	Rates.	Number.	Rates.	Number.	Rates.
1906 ..	5,061,377	1,335	26·37	23,973	473·64	3,541	69·93
1907 ..	6,405,634	1,743	27·21	22,610	352·97	1,752	27·35
1908 ..	6,436,420	2,105	32·69	23,487	364·90	3,380	52·49
1909 ..	6,610,204	2,290	33·62	25,751	378·12	3,620	53·14
1910 ..	7,328,481	2,197	29·97	26,359	359·68	5,606	76·47
1911 ..	7,613,375	2,181	28·62	28,181	370·15	6,009	78·89
1912 ..	7,817,126	3,327	42·39	27,229	345·99	5,462	69·59
1913 ..	8,067,981	2,314	28·67	18,526	229·62	8,023	49·84
1914 ..	8,315,129	1,732	21·08	20,285	246·92	5,144	62·60
1915 ..	8,353,013	1,632	19·44	24,826	297·21	5,516	66·03
1916 ..	8,492,407	1,635	19·26	26,088	307·19	6,773	79·72
1917 ..	9,149,901	1,745	19·17	29,074	317·75	7,953	86·93
1918 ..	9,314,445	2,466	26·49	38,322	411·42	12,597	135·29
1919 ..	9,478,929	3,009	31·74	37,726	398·00	12,387	130·68
1920 ..	9,627,450	1,797	18·77	29,653	308·00	13,036	135·41
1921 ..	10,081,267	1,935	10·19	28,407	281·78	15,847	157·19
1922 ..	10,547,349	1,915	18·16	27,196	257·84	16,270	154·25
1923 ..	11,067,117	1,726	15·60	24,142	218·14	18,100	163·55
1924 ..	11,234,415	1,983	17·33	26,740	232·94	19,013	165·63
1925 ..	11,401,708	2,261	19·909	24,329	213·389	18,542	162·624
1926 ..	11,568,994	2,050	17·719	24,368	210·631	19,204	165·995

* Summation of Christian and non-Christian population of provinces reporting cases.

APPENDIX F.

29th September, 1898—*25th August,* 1899.

FRANK S. BOURNS, Major and Chief Surgeon, United States Volunteers ; President, Board of Health for the City of Manila (Provisional).

26th August, 1899—*11th December,* 1900.

GUY L. EDIE, Major and Surgeon, United States Volunteers; Commissioner of Public Health (Reorganized Board of Health), City of Manila.

12th December, 1900—*25th July,* 1901.

FRANKLIN A. MEACHAM, Major and Surgeon, United States Volunteers; President, Board of Health.

Appendix E

Total deaths from certain causes, with death rates per 100,000 population, in the Philippines

Year	Population *	Diphtheria		Influenza		P Tuberculosis	
		Number	Rates	Number	Rates	Number	Rates
1906	5,061,377	881	17 40	624	12 32	12 532	247 51
1907	6 405 634	1,005	15 68	578	9 02	12,802	199 84
1908	6 436,420	785	12 19	392	6 09	15 125	234 89
1909	6 610 204	840	12 33	450	6 61	15 294	224 52
1910	7,328,481	619	8 45	396	5 03	16 513	225 24
1911	7,613,375	595	7 82	489	6 42	17,799	233 89
1912	7,817,126	727	9 26	520	6 63	16 412	209 09
1913	8 067,981	585	7 26	683	8 40	16 078	199 21
1914	8,315,1[illegible]9	518	6 30	896	10 91	17 753	216 13
1915	8,353,013	603	7 22	1 273	15 24	18 317	219 25
1916	8 492 407	522	6 15	1,477	17 39	19,249	226 56
1917	9,149,901	645	7 05	1,608	17 57	21,104	230 67
1918	9 311,445	541	5 81	77 515	832 20	26,862	288 33
1919	9,478,929	489	5 16	7,629	80·48	26 644	281 09
1920	9 627,450	310	3 22	1,630	16 93	24 677	256 33
1921	10 081 267	237	2 35	2 131	21 14	24 913	247 11
1922	10 347,349	142	1 35	2 910	27 08	[illegible]3 233	2[illegible]0 27
1923	11 067,117	170	1 61	3,739	33 78	26 927	243 30
1924	11 234 415	118	1 55	6,734	58 67	27 [illegible]	[illegible]41 81
1925	11,401,708	98	0 865	[illegible]	41 712	[illegible]6 801	236 [illegible]
1926	11,[illegible]	120	1 037	6 283	54 303	28 536	[illegible]

* Summation of Christian and non Christian population of provinces reporting cases

Appendix H.

Number of medical graduates turned out by the Santo Tomas University and the University of the Philippines.*

Year.	Santo Tomas University.	University of the Philippines.	Total.
1875 ..	2	..	2
1876 ..	0	..	0
1877 ..	7	..	7
1878 ..	4	..	4
1879 ..	6	..	6
1880 ..	6	..	6
1881 ..	5	..	5
1882 ..	3	..	3
1883 ..	9	..	9
1884 ..	8	..	8
1885 ..	7	..	7
1886 ..	5	..	5
1887 ..	5	..	5
1888 ..	6	..	6
1889 ..	10	..	10
1890 ..	20	..	20
1891 ..	14	..	14
1892 ..	11	..	11
1893 ..	8	..	8
1894 ..	9	..	9
1895 ..	14	..	14
1896 ..	6	..	6
1897 ..	10	..	10
1898 ..	32	..	32
1899 ..	0	..	0
1900 ..	0	..	0

* The Santo Tomas University was founded in April 1611, and its College of Medicine was inaugurated in 1872.

Appendix F—*concld*

26th July, 1901—*31st July*, 1902

L M Maus, Lieutenant Colonel and Deputy Surgeon General, United States Army Commissioner of Public Health for the Philippine Islands

1st August, 1902—*31st August*, 1902

Frank S Bourns, Major and Chief Surgeon, United States Volunteers, Commissioner of Public Health (Temporary)

1st September, 1902—*31st October*, 1905

F C Carter, Major and Surgeon, United States Army, Commissioner of Public Health

1st November, 1905—*28th February*, 1915

Victor G Heiser, Passed Assistant Surgeon, U S P H and M H Service Director of Health

1st March, 1915—*31st December*, 1918

John D Long, Surgeon, United States Public Health Service, Director of Health

1st January, 1919—*24th November*, 1924 (*Acting till 30th November*, 1920)

Vicente de Jesus Seralio M D, Director of Health

25th March, 1924—

Jacobo Fajardo, M D, Director of Health

Appendix G

Statement of personnel of the Philippine Health Service

Year	Medical officers	Nurses	Sanitary inspectors	Remarks
1915 *	81	104	12	Provincial employees excluded No available record
1916	73	35	34	Do
1917	85	50	40	Do
1918	75	60	64	Do
1919	.			No data available
1920	106	71	135	Provincial employees excluded No available record.
1921	105	71	180	Do
1922	121	81	159	Do.
1923	342	107	1,294	Complete
1924	336	244	1,465	Do
1925	426	270	1,359	Do
1926	423	265	1,420	Do.

* Including the personnel of the Philippine G[illegible] which was then un[illegible] the Philippine Health Service

APPENDIX I.

Number of lepers collected from various parts of the Philippine Islands.

Year.	Lepers.	REMARKS.
1906 ..	507	
1907 ..	690	
1908 ..	1,603	
1909 ..	1,378	
1910 ..	930	
1911 ..	889	
1912 ..	964	
1913 ..	772	
1914 ..	859	(Excluding 23 lepers from Guam.)
1915 ..	555	
1916 ..	966	
1917 ..	613	
1918 ..	971	(Excluding 2 lepers from Guam.)
1919 ..	547	(Excluding 4 lepers from Guam.)
1920 ..	604	
1921 ..	514	
1922 ..	819	
1923 ..	733	(Excluding 1 leper from Guam.)
1924 ..	434	
1925 ..	464	
1926 ..	444	
TOTAL ..	16,256	
AVERAGE ..	774·09	

APPENDIX H—*concld.*

Year.	Santo Tomas University	University of the Philippines	TOTAL.
1901	9		9
1902	25		25
1903	14		14
1904	18		18
1905	25		25
1906	12		12
1907	12		12
1908	24		24
1909	18	8	26
1910	16	12	28
1911	34	3	37
1912	54	9	63
1913	45	8	53
1914	29	9	38
1915	47	16	63
1916	35	5	40
1917	35	22	57
1918	48	23	71
1919	44	24	68
1920	57	28	85
1921	65	23	39
1922	61	25	86
1923	41	17	58
1924	44	11	55
1925	48	20	68
1926	64	29	93
1927	68	28	96
TOTAL	1,199	320	1,519

APPENDIX K.

Health Finance.

Year.	Insular Aid.		Provincial and Municipal Aid.* Pesos.
	Expenditures. Pesos.	Appropriations. Pesos.	
From 1st July, 1905 to 30th June, 1906	834,409.02	..	..
From 1st July, 1906 to 30th June, 1907	885,719.24	..	..
From 1st July, 1907 to 30th June, 1908	950,893.57	..	..
From 1st July, 1908 to 30th June, 1909	1,413,422.78	..	..
From 1st July, 1909 to 30th June, 1910	1,472,211.45	..	..
From 1st July, 1910 to 30th June, 1911	1,602,918.70	..	..
From 1st July, 1911 to 30th June, 1912	1,614,329.02	..	..
From 1st July, 1912 to 30th June, 1913	1,651,529.38	..	..
From 1st July, 1913 to 31st Dec. 1913	849,756.59	..	..
1914	1,176,334.94	..	..
1915	1,165,357.83	1,306,600.80	..
1916	1,259,596.14	1,269,490.00	..
1917	1,232,590.30	1,208,086.00	..
1918	2,011,957.04	1,672,930.80	..
1919	2,410,616.22	2,540,536.00	..
1920	2,946,662.12	3,035,694.00	1,068,194.46
1921	2,823,889.21	3,053,828.00	1,159,332.87
1922	2,315,925.04	2,950,012.00	1,231,089.15
1923	3,190,011.35	3,166,233.00	1,439,880.91
1924	3,229,274.13	3,208,813.00	1,302,726.33
1925	3,334,476.53	3,208,398.00	1,399,421.58
1926	3,440,269.17	3,279,238.00	1,380,223.89
1927	..	3,616,652.00	..

* Data incomplete.

Appendix J

Lepers in the Philippines

Year	San Lazaro Hospital, Manila		Culion Leper Colony	
	Admitted	Sent to Culion	Admitted	Discharged as cured
1898	3			
1899	18			
1900	58			
1901	21			
1902	57			
1903	45			
1904	82			
1905	54			
1906	36		802	
1907	34		690	
1908	21		1 603	
1909	275		1 3[illegible]8	
1910	365		[illegible]30	
1911	394		88[illegible]	
1912	323		904	
1913	194		772	
1914	402		8[illegible]9	
1915	468		5[illegible]5	
1916	300		966	
1917	329	164	61[illegible]	
1918	302	260	[illegible]70	
1919	2[illegible]5	170	547	
1920	315	208	604	
1921	359	193	514	
1922	492	254	819	32
1923	386	146	732	76
1924	426	91	434	64
1925	438	96	464	172
1926	520	102	445	179
Total	6 972	1 684	16 550	523

Re-admission, transfers and escapes not included.

The number of discharged as cured are the combined figures from San Lazaro Hospital and Culion Leper Colony.

The actual lepers in the Philippines as of 1st October, 1927 is as follows —

Culion	5 098
Manila (San Lazaro Hospital)	564
Cebu (Treatment Station)	311
Other detention camps (Provinces)	31
Total	6 004

APPENDIX L—*concld.*

HOSPITALS.	Number.	Bed Capacity.	
MILITARY HOSPITALS.			
Manila	1	250	
Provinces	6	668	
TOTAL ..	7	918	
PRIVATE HOSPITALS.			
Mission Hospitals :			
Manila	5	456	
Provinces	14	499	Bed capacity of Leyte Mission Hospital and Sallie Long Read Hospital not included.
TOTAL ..	19	955	
Society Hospitals :			
Manila	1	70	
Provinces	3	290	
TOTAL ..	4	360	
Industrial Hospitals :			
Manila	0	0	
Provinces	4	92	Bed capacity of Cadiz Saw Mill Hospital not included.
TOTAL ..	4	92	
Summary of Private Hospitals :			
Manila	6	526	
Provinces	21	881	
TOTAL ..	27	1,407	
RECAPITULATION.			
Manila	11	2,968	
Provinces	66	2,656	
Culion	1	500	
TOTAL ..	78	6,124	

Note.—From the foregoing list, the Cebu Leper Detention Camp composing of several cottages with a combined capacity of 200 beds is not included. This Camp is at present used for the housing of positive lepers awaiting transportation to Culion.

Appendix L

Hospitals in the Philippines.

(*1st November*, 1927)

Hospitals.	Number	Bed Capacity
Government Hospitals		
Under the Philippine Health Service		
Manila	1	1,265
Culion	1	500
Provinces	30	917
Total	32	2,682
Under the Department of the Interior		
Manila	1	601
Provinces	1	70
Total	2	671
Under the Department of Justice		
Manila	1	300
Provinces	2	65
Total	3	365
Under the Public Welfare Commissioner		
Manila	1	26
Provinces	6	55
Total	7	81
Summary of Government Hospitals		
Manila	4	2,192
Culion	1	500
Provinces	39	1,107
Total	44	3,799

APPENDIX L—*concld.*

Hospitals.	Number.	Bed Capacity.	Remarks
MILITARY HOSPITALS.			
Manila	1	250	
Provinces	6	668	
TOTAL ..	7	918	
PRIVATE HOSPITALS.			
Mission Hospitals:			
Manila	5	456	
Provinces	14	499	Bed capacity of Leyte Mission Hospital and Sallie Long Read Hospital not included.
TOTAL ..	19	955	
Society Hospitals:			
Manila	1	70	
Provinces	3	290	
TOTAL ..	4	360	
Industrial Hospitals:			
Manila	0	0	
Provinces	1	92	Bed capacity of Cadiz Saw Mill Hospital not included.
TOTAL ..	1	92	
Summary of Private Hospitals:			
Manila	6	526	
Provinces	21	881	
TOTAL ..	27	1,407	
RECAPITULATION.			
Manila	11	2,968	
Provinces	66	2,656	
Culion	1	500	
TOTAL ..	78	6,124	

Note.—From the foregoing list, the Cebu Leper Detention Camp composing of several cottages with a combined capacity of 200 beds is not included. This Camp is at present used for the housing of positive lepers awaiting transportation to Culion.

Appendix M.

Philippine Health Service, Manila.

Administrative Order No 47. *23rd September*, 1927

Subject —Revised regulations governing the detection, detention, transportation, care, treatment and discharge of lepers, and the disposal of children born of leper parents, suspicious cases and clinical lepers

1. Officers and employees of the Philippine Health Service are hereby directed *to comply* with the *following* regulations which have been approved by the Honourable the Secretary of Public Instructions, on 9th June, 1927

Revised Regulations governing the Detection, Detention, Transportation, Care, Treatment and Discharge of Lepers, and the Disposal of Children born of Leper Parents, Suspicious Cases and Clinical Lepers

Under the authority of Article XV of Chapter 37 of the Administrative Code, the following revised regulations have been promulgated

Definitions

For the purpose of these regulations the following definitions are given

1 *Suspects* are persons alleged or believed to have leprosy, subjects for diagnostic examination

2 *Suspicious* cases are those found, on diagnostic examination, to present clinical signs suspicious of leprosy but not sufficient for a positive clinical diagnosis, and to be bacteriologically negative by the standard method

3 *Clinical lepers* are those with definite clinical manifestations of leprosy but who are bacteriologically negative

4 *Positive lepers* are cases found positive for the leprosy bacillus (*Mycobacterium leprae*)

5 *Non leprous children* are those born of leper parents, while living in Culion, San Lazaro Hospital or other place of detention of this Service, who do not show any evidence of leprosy

6 *Non leprous contacts* are individuals, presenting no clinical or other evidence of leprosy, who, for relatively long periods, have lived or have been living in close contact with positive lepers, such persons are those who have been living in the same house or in the same room with a positive leper or who have been otherwise specially exposed to infection

7 *Negative candidates* are positive lepers who have improved clinically to such a degree that there is likelihood that they may on examination be found ' negative '

8 *Negatives* are persons, previously positive lepers, who have been found bacteriologically negative and without any active clinical manifestation of leprosy (Par 52)

9 *Negative and probationary periods —The negative period* is a period of two years of continued observation and treatment immediately following the date a positive leper is declared negative The *probationary period* is the first six months of the negative period

10 *Negatives under detention* are negatives held in segregation, as is required during the probationary period, or to the end of the negative period unless paroled

11 *Negatives under parole* are those conditionally released within the negative period but after the probationary period (Par 56)

12 *Discharged negatives* are those who have completed without interruption the *full* negative period and have been discharged (Par 61)

13. *Negatives returned positive.*—Under this are events of two categories : (*a*) 'Interruptions'—Instances in which bacteriological re-examinations of negatives give positive results, without clinical evidence of recurrence of the disease. (*b*) 'Relapses'—Instances in which negatives are again found to be bacteriologically positive and to show clinical signs of recurrence of the disease. In either event the patient is again dealt with as a positive leper, but the events are to be distinguished in the records.

14. *Clinical recurrence.*—The occurrence of clinical signs of recurrence in a negative, but with continued negative bacteriological findings (Par. 64).

15. *Standard examinations.*—The criteria and methods to be used in clinical and bacteriological examinations are described in the leprosy booklet of this Service. All health officials are expected to familiarize themselves with this publication.

Committees on Diagnosis and Treatment of Leprosy.

16. Except when otherwise provided, the district health officer of each province, the assistant district health officer (or, lacking such, a president of sanitary division designated by the Director of Health), and the provincial bacteriologist shall constitute a Committee for the Diagnosis and Treatment of lepers, more briefly referred to hereinafter as the 'Examining Committee.' The district health officer shall be the chairman of such committee.

17. The examining committee shall meet at regular intervals as required by the local needs and as approved in each case by the Director of Health, and at other times, when necessary, to examine new suspects, suspicious cases and clinical-lepers under observation, negative candidates, negatives under detention or parole, discharged negatives and non-leprous children under observation, and to treat or to direct the treatment of cases requiring treatment. At its meetings it shall discuss the leprosy situation in the region of jurisdiction and the measures necessitated thereby, the matters considered and conclusions reached to be incorporated in its minutes (Par. 76).

18. Authority for final diagnosis, and for the release of negatives shall reside in only such committees to which such authority is specially delegated by the Director of Health. Such committees are hereafter referred to as Disposal Committees. All persons coming under the scope of these regulations, with the exception of suspects found definitely non-leprous by the local committees on the first examination, shall be subject to examination by the nearest disposal committee, or by the collecting trip committee as hereinafter specified, for confirmation of diagnosis and disposal. However, patients awaiting such confirmation shall be given treatment.

Diagnostic Examination and Disposal of Cases.

19. All persons alleged, or believed, to have leprosy shall be subjected to thorough clinical and standard bacteriological examination by an examining committee, one or more times as hereinafter provided. The clinical examination shall include, besides thorough inspection of the skin surface, proper tests for sensory disturbances, and examination for enlargement of superficial nerves and lymph nodes, and lesions of the nasal mucosa ; the bacteriological examination shall be of more than one smear, and shall include smears from both sides of the nasal septum, unless the patient is otherwise found positive.

20. All persons so examined and found clearly negative shall be released at once, with a properly dated certificate setting forth the fact that on examination he or she was found without evidence of leprosy.

21. Those found to be bacteriologically positive lepers shall be isolated (Sec. 1059, Administrative Code, 1917), and dealt with as hereinafter provided.

22. Non-leprous contacts shall not be isolated, but they may be given anti-leprosy treatment if they request it and will present themselves at the proper station regularly to receive it. The prophylactic value of treatment should be carefully explained to them.

23. All cases tentatively diagnosed on first examination as suspicious or clinically leprous but found bacteriologically negative shall, unless sooner found positive, be subjected to not less than four re-examinations by the examining committee, these re-examinations to be within a total period of not more than two months from the first examination. If continuously negative bacteriologically they shall be released, if under detention, and thereafter dealt with according to their final diagnosis (Pars.

APPENDIX M.

Philippine Health Service, Manila.

ADMINISTRATIVE ORDER NO. 47. *23rd September*, 1927.

Subject.—Revised regulations governing the detection, detention, transportation, care, treatment and discharge of lepers, and the disposal of children born of leper parents, suspicious cases and clinical lepers.

1. Officers and employees of the Philippine Health Service are hereby directed to comply with the following regulations which have been approved by the Honourable the Secretary of Public Instructions, on 9th June, 1927.

REVISED REGULATIONS GOVERNING THE DETECTION, DETENTION, TRANSPORTATION, CARE, TREATMENT AND DISCHARGE OF LEPERS, AND THE DISPOSAL OF CHILDREN BORN OF LEPER PARENTS, SUSPICIOUS CASES AND CLINICAL LEPERS

Under the authority of Article XV of Chapter 37 of the Administrative Code, the following revised regulations have been promulgated

DEFINITIONS

For the purpose of these regulations the following definitions are given

1. *Suspects* are persons alleged or believed to have leprosy, subjects for diagnostic examination

2 *Suspicious* cases are those found, on diagnostic examination, to present clinical signs suspicious of leprosy but not sufficient for a positive clinical diagnosis, and to be bacteriologically negative by the standard method.

3. *Clinical lepers* are those with definite clinical manifestations of leprosy but who are bacteriologically negative.

4. *Positive lepers* are cases found positive for the leprosy bacillus (*Mycobacterium leprae*)

5. [illegible] are those born of leper parents, while living in Culion, San Lazaro Hospital [illegible]

6 [illegible], who, [illegible] relatively long periods, have lived or have been living in close contact [illegible], such [illegible] with a positive leper [illegible]

7. *Negative candidates* are positive lepers who have improved [illegible] to such a degree that there is likelihood that they may on examination be found 'negative.'

8. *Negatives* are persons, previously positive lepers, who have been found bacteriologically negative and without any active clinical manifestation of leprosy (Par. 52).

9 *Negative and probationary periods*—The *negative period* is a period of two years of continued observation and treatment immediately following the date a positive leper is declared negative. The *probationary period* is the first six months of the negative period.

10. *Negatives under detention* are negatives held in segregation, as is required during the probationary period, or to the end of the negative period unless paroled

11. *Negatives under parole* are those conditionally released within the negative period but after the probationary period (Par. 56)

12. *Discharged negatives* are those who have completed without interruption the full negative period and have been discharged (Par 61)

The condition of this obligation is such that whereas the above bounden............. upon proper medical examination has been determined to be a leper suspect and has agreed to present and surrender himself to the district health officer or other duly authorized agent of the Director of Health at .... upon such date as the district health officer or other authorized agent of the Director of Health may require by notice not less than ten days previous to such date, and to remain meanwhile upon his own premises, and to keep separately all clothing, bedding and household furnitures and utensils for his use, and to avoid contact with all non-leprous persons; now therefore, if the said.................. shall well and truly perform the said promise and undertaking then this obligation to be void, otherwise to be and remain in full force and virtue.

____

Principal.

____________________ ____________________

Surety No. 1. *Surety No. 2.*

ACKNOWLEDGMENT OF PRINCIPAL.

Personally appeared before me ...., aged ...., known to me to be the person who executed the foregoing bond as principal, holding cedula No........ issued at ....and dated ....and acknowledged such execution to be his free and voluntary act and deed.

Subscribed and sworn to before me this........day of ...., A.D., 19.....

____

ACKNOWLEDGMENT OF SURETY NO. 1.

Personally appeared before me ...., of legal age, known to me to be the person who executed the foregoing bond as Surety No. 1, and acknowledged such execution to be his free and voluntary act and deed and who stated under oath that he was worth a sum exceeding the amount of the bond over and above all liabilities. He exhibited his cedula No.......... issued........... dated..................

Subscribed and sworn to before me this..... day of ...., A.D., 19.....

____

ACKNOWLEDGMENT OF SURETY NO. 2.

(*Same as for 'Surety No. 1,' except that these words shall be changed to read 'Surety No. 2.'*)

A copy of this bond shall be forwarded to the Director of Health, with any other pertinent information relative to the case.

32. Upon failure of a bonded leper or suspect to appear, having been notified in sufficient time to do so, the notification having been served upon him, or in case of his absence, a copy thereof having been left at his usual place of residence in the hands of some person resident the rein of sufficient discretion to receive the same, and the person responsible for him notified, by messenger or by registered mail and receipt therefor obtained his bond shall be forfeited and he shall be apprehended and isolated in the nearest available detention camp, or other place provided : *Provided*, that if the person responsible for him is a corporation, service of notice may be made to the proper officer thereof, or if such officer can not be found, service may be made by leaving the copy at the office of such officer.

33. District health officers when provisionally releasing suspected lepers, as provided for above, shall see to it that so far as possible such persons are isolated in their homes. They should not be allowed contact with non-leprous persons, they should have separate clothing, separately washed and separate bedding, furniture and utensils. They shall be provided with disinfectant and instructed in its use. Frequent inspections shall be made by the local health officer or sanitary inspector, or in default of the latter by the Chief of Police, to see to it that instructions are properly carried out.

25—27) No case diagnosed suspicious or clinically leprous shall be later declared non leprous until this is approved by a disposal committee

24 Every effort shall be made to establish correct diagnoses of suspicious cases (every such case is leprosy or something else there is no border line condition) When in such a case there is a skin lesion of uncertain nature, a suitable specimen shall be removed and properly preserved, packed and sent to the Director of Health for histological examination, unless permission is granted by the Director of Health to make other arrangements for such examination

25 Suspicious cases shall be advised, but (except in the case of children born in segregation that have become suspicious, Par 70) shall not be required, to take regular treatment for at least a year, *they shall be treated if they consent* In any case, all such patients shall be re-examined clinically and bacteriologically every three months for two years unless sooner declared non leprous In case the patient has been consistently negative bacteriologically he shall then be released from further observation, provided there has been no aggravation of the signs Should there have been such aggravation, but the committee does not consider the patient to have become a clinical leper (in which case he would be dealt with as such) the matter shall be referred to the Director of Health with the case record, for instructions

26 *Cases declared clinical lepers shall, unless previously proven to be non leprous* be required to receive treatment for a period of not less than two years (Par 44), and clinical case records shall be kept as for lepers under detention (Par 72) *They shall be thoroughly* examined by the examining committee at intervals of three months

27 At the conclusion of the treatment period, in the absence of positive bacteriological findings or evidence of clinical activity of the disease, the patient shall be subject to the periodic re examinations required for discharged negatives Should there be evidence of clinical activity (but with negative *bacteriological findings*), treatment shall be continued for not less than one year after subsidence of this apparent activity

Detention and Bonding

28 Positive lepers awaiting transfer to a Treatment Station or to Culion and clinically positive cases awaiting the results of the required examinations, shall be held in detention camps or in other places as may be arranged, with the approval of the Director of Health

29 Persons considered suspicious but not diagnosed clinically positive need not be detained during the examination period, provided their appearance for the required examinations can be definitely assured Persons so classified who voluntarily presented themselves for examination may *temporarily be released on their own cognizance* Suspects who have been brought to the committee by arrest shall, if in the opinion of the examining committee this precaution is necessary, be released only under bond as hereafter provided

30 Cases under detention shall be housed, fed, if necessary clothed, and otherwise cared for in a manner in keeping with the living condition of the majority of the people in the same regions [illegible] will be enforced in such detention camps and treatment stations However, [illegible] for proper sanitation and hygiene

31 *When bond is required for the temporary release of a leper, this shall be of sufficient amount* to insure the presentation of said leper when required, but not less than Two Hundred Pesos (P 200 00) in each case It shall be secured by a deposit of cash The bond shall be prepared strictly in accordance with the following form

Bond of Surety for Appearance of Suspected Leper

Know all men by these presents, that we as principal and as sureties, are held and firmly bound unto the Government of the Philippine Islands in the sum of *Two Hundred Pesos (P 200 00) lawful money of the Philippine Islands,* which amount we hereby deposit with , to be paid to said Government of the Philippine Islands or their agents or assigns

TREATMENT BY PRIVATE PHYSICIANS.

48. Any leper who desires to be treated by a private physician shall file a written application with the Director of Health, or with the district health officer, using the following form (Administration. Order No. 25):

1. I,........., age......, sex....., single, married, residing at............... whose parents are .... and ...., residing at .... (if a minor, the consent of the guardian should accompany the statement), hereby state that I desire to be treated by a private physician by the name of ...., residing at ...., at my expense.
2. I understand that if allowed by the Health authorities to submit to treatment by a private physician, the Philippine Health Service will not be held responsible for whatever may be the result of the treatment given by the private physician.
3. I shall observe all the administrative rules and regulations regarding the segregation of lepers promulgated by the Philippine Health Service.

(Signature).

49. Any private physician who desires to treat positive lepers shall file a written application with the Director of Health, through the district health officer, using the following form:

1. I, ..., age ...., sex ...., single, married, residing at .... a practising physician in the Philippines under registration certificate No ...., a graduate of ....*(Name of University), hereby declare that I am authorized* by the Philippine Health Service to treat lepers, that I assume all the responsibility for the treatment to be given by me to the leper patient.
2. I shall furnish the nearest Health Officer a true copy of the formula of the drug or prescription and sample of the drug to be administered by me to each and every leper patient I may be authorized to treat.
3. I shall keep a daily record of the treatment with observations regarding the condition of the patient and shall furnish copy of said record to the nearest local Health Officer.
4. I shall submit to the Director of Health or to his duly authorized representative a monthly report regarding the physical condition of the patient being treated by me and the result of said treatment. I shall observe and comply with all the rules and regulations governing the segregation of lepers.

(Signature of Physician).

50. Any private physician granted the privilege here provided for shall submit to the Director of Health, through the district health officer and on the official form to be provided for the purpose, a monthly report of the physical condition of the patients treated by him, the result of his treatment and such other pertinent observations on the case as the Director of Health may require.

51. A private physician shall not be allowed to treat suspicious cases, clinical lepers and negatives under quarantine or parole, except such negatives as have become so as a result of the treatment given by the private physician concerned.

DECLARING AND CONTROL OF NEGATIVES.

52. Any previously positive leper who has improved sufficiently to be considered a negative candidate shall be submitted to a thorough clinical and bacteriological examination, with a view to declaring him or her negative, by an *Examining Committee authorized to do this.* If found on three consecutive examinations free from clinical evidence of active leprosy and bacteriologically negative by standard methods, all examinations to take place within not more than three months, such patient will be declared negative.

Leper Collection Trips

34 Unless otherwise ordered by the Director of Health, all positive lepers will be transferred to the Culion Leper Colony or to a treatment station at the earliest opportunity. Such transfers are effected by official leper collecting trips, or otherwise as ordered by the Director of Health.

35 The Director of Health will designate the following personnel to a collection trip: (*a*) a medical officer who will be in charge of the trip and of the examination of the lepers, and (*b*) a bacteriologist who will make all necessary bacteriological examinations. These two, with the district health officer at each port visited, will serve as an Examining Committee with authority to diagnose and dispose of cases. The necessary nurses and attendants will also be assigned for the proper care of the lepers.

36 On arrival at any port steps will be taken promptly to examine all patients, including the suspicious and clinically positive cases and previously positive lepers believed to have become negative, that are under the care of the corresponding district health officer, unless these have been examined by a regular Disposal Committee. Bacteriological examinations shall be made on every case examined, including those considered obviously positive.

37 The positive lepers will at once be transferred to the ship. The officer in charge will furnish the local district health officer a certified record of the findings in all other cases.

38 The district health officer will furnish the officer in charge with a list of all lepers removed by him, with the data required for the list specified below.

39 The clerk of the trip shall, from the data received, compile a list to include, for each leper taken on board: (1) number, (2) name, (3) town, (4) barrio, (5) age, (6) sex, (7) civil status, whether single, married, widower, child, etc., (8) results of clinical and bacteriological examinations (positive or negative), and (9) remarks. This list will be made in quadruplicate, one copy to be left at the office of destination and three copies to be furnished the Central Office.

40 The officer in charge shall be responsible for the proper feeding, and medical and other care of the lepers on board. He shall make detailed inspections, at least twice daily, for cases requiring medical or other attention.

41 One day before the arrival of the boat at the destination, all lepers shall be vaccinated, by or under the direct supervision of the medical officer in charge.

42 No person on the vessel shall be permitted to come in contact with the lepers unless necessary, and those as little as possible. Disinfectant shall be provided for the use of such persons.

43 The vessel shall be carefully cleansed and disinfected after leaving the destination of lepers.

Treatment, Official

44 All segregated positive lepers, clinical lepers under bond or detention, suspect children, other suspects desiring treatment, and negatives under parole, shall be given regular anti-leprosy treatment, by authorized officers of the Philippine Health Service (Circular No. 130, amending Circular No. 28), except when such treatment is positively refused by the patient, or when there is definite contraindication, or when he is treated privately as provided for herein. Records of treated cases shall be kept in accordance with paragraph 72 hereof.

45 The suitability of a patient for treatment shall be determined by the examining committee. Should a suitable patient refuse treatment, the fact, and the reason therefor, shall be stated in the case record.

46 Patients unsuitable for treatment may, at their request and on their own responsibility, despite contrary advice of the committee responsible, be given some anti-leprosy treatment, but a signed statement to that effect should be obtained from the patient and included in the case record.

47. The standard anti-leprosy drugs will be furnished by the Philippine Health Service. These are, at present, (1) iodized ethyl esters of oils of the chaulmoogra group, (2) purified whole oil (*Hydnocarpus wightiana*), and (3) the Mercado mixture. For patients in good condition the ethyl esters should be given preference; in others the oil or the mixture will be used. However, any one may be selected, or all may be used alternately when there is valid reason therefor. For details of treatment reference is to be made to the Service booklet on leprosy.

66. Upon paroling or discharging a negative the chairman of the disposal committee shall promptly report such action to the Central Office at Manila, giving the data necessary for the identification of the person, and his or her prospective address. The Central Office will at once inform the proper authority under whose jurisdiction the patient will come.

67. All examining committees shall keep a proper record of all such patients under their charge, including data on treatment, examinations, and other noteworthy events.

CHILDREN BORN OF LEPER PARENTS.

68. All children born of leper parents within any leper institution of this Service shall be removed therefrom as soon after birth as possible or feasible and given to the nearest relative or to a child welfare institution for care. Such children shall be subject to the regulations provided hereunder.

69. All non-leprous children removed from contact with lepers not later than six months after birth shall be examined for signs of leprosy not less often than once every three months for three years, after which time, if clearly negative, observation may be discontinued. Children removed from contact after six months of age shall be examined for signs of leprosy once every three months for a period of five years after removal, when if clearly negative this may be discontinued.

70. Any child found with suspicious signs of leprosy shall be examined bacteriologically. If found positive he or she shall be classified and dealt with as a leper. Those found bacteriologically negative shall be given regular treatment for not less than two years. The form of treatment to be used shall be decided by the committee.

71. After the required period of treatment during which time a suspicious child shall have been examined and found negative bacteriologically not less frequently than every three months, and in the absence of more definite signs of leprosy, treatment may be discontinued. However, observations should be continued every three months for a further period of five years. Should at any time such a child become bacteriologically positive he shall be dealt with as a positive leper.

RECORDS AND REPORTS BEARING ON SEGREGATED LEPERS, ETC.

72. A complete clinical record shall be made for each leper isolated in a detention camp, on Form No. 26, provided for this purpose. These records shall include the usual personal data, information obtainable concerning contacts with lepers and onset of the disease, findings of physical and laboratory examinations, photographs if possible, and record of treatments given and of all noteworthy reactions and incidents. Such records shall be forwarded with each patient on his or her transfer to another place of detention, but if desired a copy or abstract thereof may be retained.

73. In addition to Form No. 26, for cases undergoing treatment at a treatment station (as San Lazaro Hospital and Cebu) and at Culion, a special treatment record shall be prepared in duplicate in accordance with C. L. C., P. H. S. Form No. 154, one copy to be forwarded to the Central Office. On transfer of a patient from a treatment station to Culion, this record shall also be forwarded with the patient, a copy or abstract being retained if desired.

74. In addition to Provincial Form No. 186 (Monthly Health Report, or Form 70 as amended), individual records of all newly isolated lepers shall be made according to Philippine Health Service Form No. 50 (enclosure of Circular No. 88, 29th January, 1926), and submitted by the district health officers in weekly reports to the Director of Health.

75. Chairmen of examining committees shall also render to the Director of Health monthly reports on (1) paroled negatives and (2) clinical lepers treated and examined, and (3) discharged negatives, and (4) non-leprous children examined, according to the specifications of Circular No. 90, Exhibits A and B (1st February, 1926), modified as required to signify the classification of all cases dealt with.

76. The chairmen of the examining committees shall forward monthly to the Director of Health the minutes of meetings of their respective committees, as well as the information concerning detention camps in the provinces as required by Circular No. 89 (30th January, 1926), and other reports herein required.

77. Brief detailed descriptions of cases finally diagnosed as suspicious, or clinical lepers, and dealt with as such, shall, in the first monthly report subsequent to the making of such diagnosis, be

53 All patients so found negative shall undergo a 'negative period' of continued observation and treatment, this period to be two years from the date of the first negative examination

54 Whenever possible, negatives under detention shall be separated from positive cases, preferably immediately after the second negative examination

55 During the negative period the patients shall be re-examined by the local examining committee, clinically and bacteriologically, not less often than once in three months

56 Negatives, after a probationary detention period of six months without interruption or relapse, may on request be paroled by a disposal committee The conditions of this privilege are (1) that they shall agree, in writing to report once a week, to the committee or to a designated health official, for continued observation and treatment, until the completion of the negative period *provided*, however, that paroled patients who so request may, at the discretion of the treating officer be granted not more than two weeks' absence at intervals of not less than three months, (2) that in case they are treated by a designated health official they will report once every three months, as they shall be instructed, to the proper (nearest) examining committee for special examination

57 Negatives eligible for parole who prefer to remain until the completion of the negative period in the institution where treated shall be permitted to do so Such negatives under detention may, on request, be permitted by the officer in charge to absent themselves from said institution for not more than two weeks, at intervals of not less than three months and under conditions prescribed by the said officer in charge This privilege shall in no case be granted before the completion of the six months' probationary period

58 If in the opinion of the examining committee the condition of a negative under parole does not permit treatment, this may be foregone but the facts in the case must in every instance be included in the monthly report of the local examining committee to the Director of Health

59 Paroled negatives living in or sufficiently near to the head quarters of a Disposal Committee shall report for weekly treatment to the said Committee at a time and place required by it and those living elsewhere shall report for this purpose to their district health officers, or presidents of sanitary divisions as instructed, each at a time and place fixed by the officer concerned

60 Any paroled patient who fails to live up to the conditions of parole shall be re apprehended and kept under detention until the completion of the negative period, unless it be otherwise ordered by the Director of Health Any negative who, having chosen to remain in detention, abuses the quarterly vacation privilege shall be re apprehended and deprived of said privilege, unless it be otherwise ordered

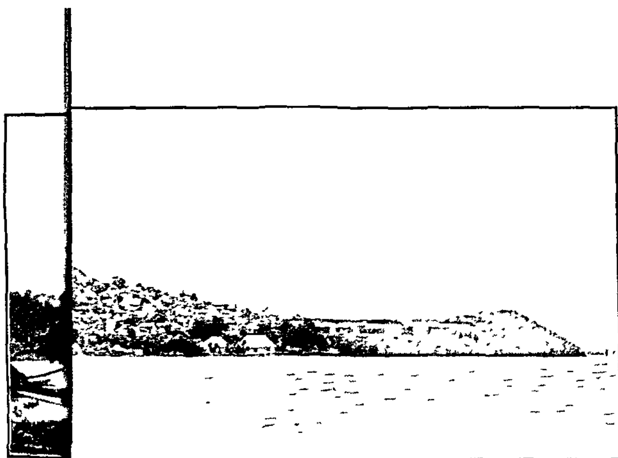
61 After completion of two years' negative period without interruption or relapse a negative leper shall be 'discharged' He shall not be required to undergo further treatment, though he may be advised to do so, and treated further if he wishes it He shall however, be required to report for examination to the nearest examining committee once every three months for a period of one year, and thereafter, once every six months for a period of four years these examinations being for the purpose of detecting relapses and other conditions of importance pertinent to the proper following up of the case

62 Each negative leper paroled or discharged shall be provided with a certificate showing the necessary data for his or her identification, and address Thereafter this certificate shall be endorsed by the committee each time the patient reports, with dates, data on treatment given, and the results of the required periodical examinations

63 All examinations of specimens for *M lepre* taken by the provincial examining committees from paroled cases believed to have returned positive shall be confirmed by the nearest disposal committee, a duplicate unstained slide being sent to the chairman thereof together with the stained one examined

64 Negatives in whom occurs clinical recurrence only (Par 11) shall be repeatedly examined bacteriologically, but if the findings are consistently negative the event shall not interrupt the negative period, *provided*, however that no such case shall be certified as a discharged negative within less than one year after the subsidence of the signs of reactivation during this time treatment shall be continued, unless contra indicated

65 All negative lepers paroled or discharged under the conditions specified shall notify the Director of Health, through the district health officer, of any change in residence



ing District.

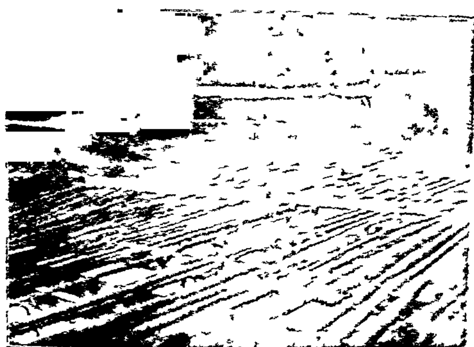


Fig. 2. Interior de la casa de observ[illegible]n del Hospital de [illegible] destinada para los casos [illegible]echo[illegible]os de lepra. [illegible] de hombres.



[illegible] 3 Inter[illegible]r de la casa [illegible] [illegible] [illegible] [illegible]estinada para l[illegible] [illegible] [illegible] de muj[illegible]

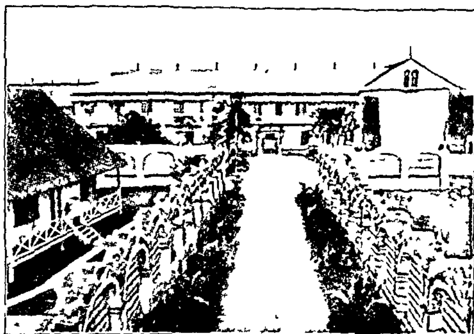


Fig. 4. Antiguo edificio del Hospital de San Lazaro en [illegible] construido por los españoles desde los comienzos de su arribo en las mismas, y destinado para la reclusión de los leprosos. Actualmente es [illegible] (Manila)



Fig. 5. [illegible] terrenos del Hospital de San [illegible]



Fig. 6. The Culion Leper Colony. The Baldad and (extreme right) Palumpong farming districts.



Fig. 7. The Culion Leper Colony. Overlooking one of the farming districts (Pilapilan).



FIG. 8. The Culion Leper Colony. Within the colony proper, northern front including (above) the old church and Treatment Clinic I, and (below) the private electric power and ice plant.

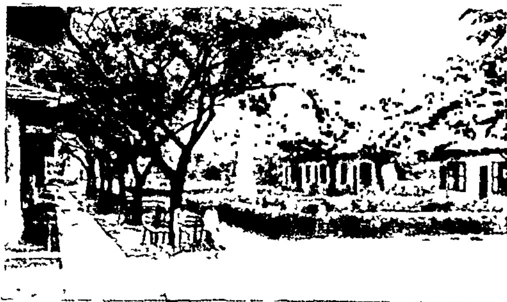
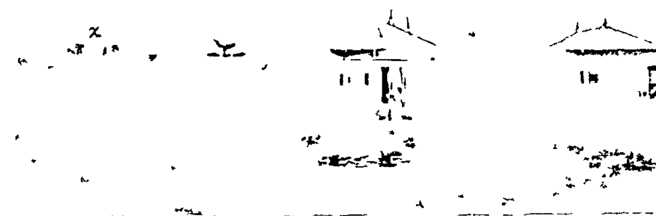


FIG. 9. The Culion Leper Colony. The main square, Rizal Plaza, with dormitory buildings.

PLATE LVII.



Fig. 10. Vista de frente del Hospital General de Filipinas, inaugurado desde el 1.° de Septiembre de 191
Constituye una de las más importantes mejoras sanitarias implantadas en la ciudad de Manila.



ZAMBOANGA GENERAL HOSPITAL, ZAMBOANGA, ZAMBOANGA

Fig. 11. First building inaugurated on 1st September, 1918; second building in April 1920. Capa... patients. Contagious Pavilion, 20 patients. Provided with laboratory. Building X is the Dormitory.



DAVAO PUBLIC HOSPITAL, DAVAO, DAVAO

Fig. 12. Under construction and to be inaugurated in 1921. Capacity ... The hospital actually in operation is of mixed material.

F[illegible] Lanao Public H[illegible]spital Dansalan Lanao

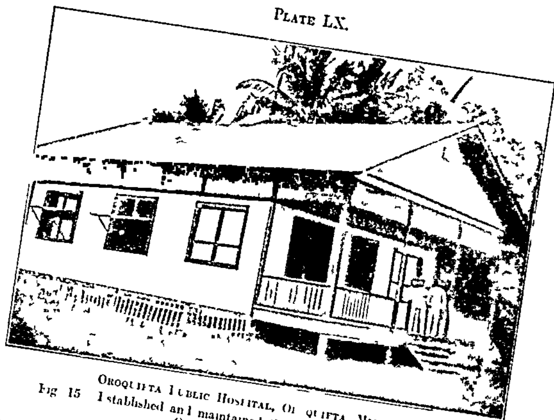
Fig. 13 Inau[illegible]urated 10th March 1914 Capacity 40 pat[illegible]ents Now ass[illegible]gned as [illegible]



[illegible] Lan[illegible] Publ[illegible] H[illegible] Camp [illegible], Lanao

Fig. 14 Formerly [illegible] Hospital [illegible] Provided with [illegible]

PLATE LX.



OROQUIETA PUBLIC HOSPITAL, OROQUIETA, MISAMIS.

Fig. 15. Established and maintained through voluntary contributions. Opened in October 19[illegible]0.

SULU PUBLIC HOSPITAL, JOLO, SULU.

Fig. 16. Inaugurated on 7th November, 1915. Capacity 40 patients. Provided with laboratory.

PLATE LXI

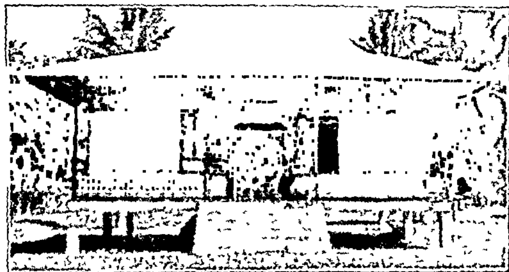


Fig. 17. Public dispensary at Bais, Oriental Negros, constructed of strong materials differently from the standard progressive dispensary.

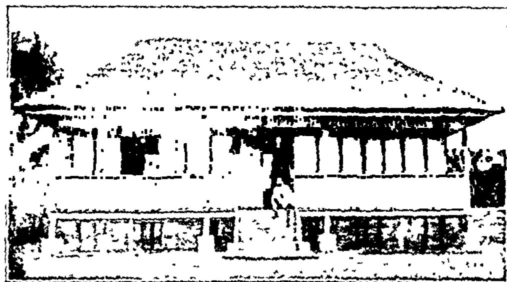


Fig. 18. Public dispensary at Ayuquitan, Oriental Negros, constructed of mixed materials differently from the standard progressive dispensary.

INTERNATIONAL EPIDEMIOLOGICAL INTELLIGENCE.

BY

R. GAUTIER.

Director, Eastern Bureau, League of Nations, Singapore.

In selecting as the subject of this short paper the above title, my intention was to bring to your notice the activities in that field of the Epidemiological Service of the League of Nations.

When at the close of the war, extensive epidemics of typhus exanthematicus and cholera raging in Russia, threatened to invade Central and Western Europe, the need of accurate and prompt epidemiological intelligence was felt acutely; such intelligence was recognized as a condition of the efficiency of the sanitary barriers to be erected around the infected areas. From that need arose the League's Epidemiological Intelligence Service, as the necessary complement of the Health Organization set up in Geneva in accordance with the provisions of the Versailles Treaty.

This service gradually extended its scope from eastern Europe to practically—with very few exceptions—all countries of the world, whether or not members of the League; it being the policy of the League's Health Organization to deal with the various sanitary administrations, irrespective of the political attitude adopted by their Governments towards the League generally.

The Epidemiological Intelligence Service in Geneva keeps the various countries informed of the trend of epidemics and disease in general, by means of weekly, monthly and yearly publications, which do not only contain fresh information of immediate use to the health administrations, but constitute a mine of statistical data, of hitherto unequalled value for all research workers in the field of epidemiology.

An offshoot of this central service was created in Singapore to serve the eastern countries; the prevalence of serious infectious diseases in that part of the world, and the possibilities of transmission from one country to another, made it imperative that the methods used by the new centre be somewhat different from those of the Geneva office, promptness in the diffusion of the collected information being there paramount.

The need of an Eastern Bureau of Epidemiological Intelligence, realized by Dr. G. E. Brooke, who was later to be its first Director, was first set forth by

rendered in duplicate to the Director of Health, for technical consideration When another diagnosis has been arrived at in a suspicious case the facts shall be referred to the Director of Health for consideration, and when such a change in diagnosis has been made by an examining committee with authority the fact shall be reported (Par 21)

Expenses

78 Expenditures for the collection, maintenance and treatment of segregated lepers shall be charged to the insular appropriation provided for that purpose

79 Requisitions for anti leprosy drugs (Circular No 130) and other necessary medical supplies shall be made directly to the Director of Health In the provinces in case of urgency, medical supplies may be obtained locally through the provincial treasurer who will later submit the proper request for reimbursement

80 The strictest economy compatible with efficient service shall be observed in requisitioning and dispensing of all materials, supplies, etc However the officers concerned will be held responsible for maintaining a sufficient, though not excessive stock of anti leprosy drugs, that the treatment of cases be not neglected Accounts of all requisitions and of materials and supplies received and on hand shall be kept, and monthly statements thereof submitted to the Director of Health No extraordinary expenses shall be incurred except on prior approval of the Director of Health for same

Conflicting Regulations

81 All rules or regulations previously promulgated that may be in conflict with the provisions herewith are hereby declared void and of no effect

(Sd) Jacobo Fajardo,
Director of Health

Approved, 9th June, 1927

(Sd) E A Gilmore,
Secretary of Public Instruction

Jacobo Fajardo,
Director of Health

One particular branch of our work is the telegraphic transmission to their next port of call of a warning of the coming of ships, having or having had on board cases of infectious diseases. Not less than thirty-five health administrations in the Eastern area have pledged themselves to notify such ships to the Bureau; a fact which, in our opinion, indicates a wide recognition of the utility of such a service.

The following instance is illustrative on that point: Once, this year, the health authorities of an important port were notified by us in advance of the coming of a ship ' infected ' with small-pox; when the captain of this ship declared on arrival that he had lost his Bill of Health, they were able to deal with the situation adequately.

All the information now received by the Eastern Bureau is sent by the health administrations as a result of voluntary agreements; when the new International Sanitary Convention comes into force, the communication of such information is to become compulsory and, according to Article 7 of this Convention, the Singapore Bureau shall act as a centre of transmission of official notifications to the Office International d'Hygiène Publique, as well as to the eastern health administrations themselves. According to the terms of the Convention, the Eastern Bureau will transmit information relating not only to ports and maritime towns, as it now does, but also to territories and countries taken as a whole. The health administrations sending the said information to the Eastern Bureau will thereby be relieved from certain other obligations otherwise incurred by them under the Convention.

In addition to the afore-mentioned activities, the Eastern Bureau has recently been entrusted with the task of ' co-ordinating ' certain researches on problems, the solution of which is of major practical importance to Eastern countries as well as of great scientific significance to the world generally. Such is the question of oral vaccination against acute intestinal diseases, a problem which has already been considered and attacked by the public health service of India. Another such question which may be touched upon in the future is that of the conditions giving rise to outbreaks of pneumonic plague.

This part of the Bureau's activities is still at its first stage and may develop later on, as conditions allow.

The work of the Eastern Bureau is directed and supervised by a special ' Advisory Council ' made up of delegates of Eastern Health Administrations, as well as by the Health Committee and other technical bodies of the League. The chairman of this Advisory Council is at present Col. J. D. Graham, I.M.S., Commissioner of Public Health with the Government of India, to the personal exertions of whom the Bureau is greatly indebted.

Allow me to emphasize here the fact that at the last Assembly in Geneva, the appreciation of the work of the Eastern Bureau was voiced by the Honourable Representative of the Government of India, Sir Ramaswami Ayyar.

Dr Norman White who made formal proposals for its establishment in his report on epidemic diseases in the Far East in 1921 As a result of a meeting in Singapore in January 1925 of delegates of eastern health administrations plans for the creation of the Eastern Bureau were submitted to the Health Committee of the League and finally endorsed by the Assembly The Bureau began functioning in March of the same year and from that time gradually extended its sphere of action and range of usefulness to reach its present state which I am now going to describe briefly

The Bureau receives weekly telegraphic information of the occurrence of plague cholera and small pox from 110 ports distributed over an area including the East Coast of Africa from Capetown to Alexandria the Asiatic coast from Suez to Vladivostock Japan the Philippines the Dutch Indies Australia and the Archipelagoes of the Pacific Our service now extends from the Suez to the Panama Canal

The information received by the Bureau for each week is embodied in a telegram distributed to the various health administrations and also sent to the Geneva Bureau the transmission is made either by wireless or by cable where the radio messages cannot be picked up This message is forwarded in our special A code, for the sake of economy and privacy and reaches the interested health administrations five days only after the close of the week referred to In cases of emergency special cablegrams are despatched before the sending of the routine weekly message The transmission of the latter message is insured by the following wireless stations Saigon Bandoeng Madras Karachi San lakan Shanghai Tananarive and Nauen , thus does our wireless system cover practically the whole of the Bureau's area Since the cost of the wireless transmission is borne by the various Governments to whom the stations belong the value of their assistance to the Eastern Bureau in this respect is obvious

Since January last a summary in clear of our weekly message is broad casted by the Station of Bandoeng and repeated by those of Madras and Karachi , recently the Central Sanitary Bureau of Japan has arranged for a re broadcast by one of the Government's wireless stations This broadcast in clear is intended to *reach ships at sea, as it may be of benefit to them to know which ports are infected* and subject to quarantine restrictions

Our telegraphic message is confirmed by immediate sending by post of a printed weekly fasciculus which contains besides information received by cable summaries of official returns data *on pilgrimages and infected rats quarantine notifications,* etc it also includes data supplied by the Australian health administrations as the result of a conference for the study of the medical problems of the Austral Pacific Zone held last winter in Melbourne

I am glad of the opportunity *afforded me by this address to thank publicly* our numerous informants for their kind co operation, which is the very foundation and *sine qua non* condition of the success and efficiency of our service

LA STERILIZATION DES EAUX D'ALIMENTATION DES VILLES DE SAIGON-CHOLON (COCHINCHINE).

PAR

A. LAMBERT,

Institut-Pasteur de Saigon.

L'EAU qui alimente les deux villes de Saigon et Cholon est puisée dans une nappe d'eau souterraine due à l'infiltration des eaux de pluie dans le sous-sol.

La protection de cette nappe, est assurée par une couche d'argile d'épaisseur très variable dont l'imperméabilité supposée n'est pas certaine sur tous les points. D'autre part les indigènes forent autour de leurs maisons, dans les villes où à la périphérie des zones de captation, des puits non maçonnés, sans margelles, surtout dans les terrains employés à la culture maraichère et fumé d'engrais humains et animaux. La couche argileuse imperméable se trouve ainsi perforée autour des habitations indigènes, dans les jardins, par un très grand nombre de puits mettant en communication directe la surface du sol et la nappe souterraine. Les pluies torrentielles qui commencent en mai par des orages espacés, pour se régulariser, en juin, par des chutes d'eau quotidiennes, entraînent dans cette nappe toutes les souillures du sol accumulées pendant la saison sèche. Les courbes de morbidité des maladies hydriques concordent, d'ailleurs exactement avec le régime des pluies.

Une autre cause de souillure permanente réside dans l'existence des canaux qui sillonnent les villes et les campagnes, et dont la profondeur, descendant—sur certains points—au-dessous de la zone imperméable, entretient une infiltration continue.

Des nombreux analyses pratiquées à l'Institut-Pasteur de Saigon, nous extrayons les rèsultats suivants relatifs à la composition de l'eau de la nappe souterraine.

Composition Chimique.

	Saison sèche.	Premières pluies.	Saison des pluies.
Matières organiques en milieu acide ..	0·5	0·5	0·2
Matières organiques en milieu alcalin ..	0·5	0·3	0·8
Ammoniaque libre	0	0	0
Nitrites	0	0	0
Nitrates en N_2O_5	3·5	5	3·75
Chlorure en NaCl	25	28	21

I believe that this short description of the work carried out by the Eastern Bureau will have shown you that this work is really of an international nature and of benefit not only to Eastern countries but also to all the many other countries having commercial relations with them This work is therefore well within the scope of the League of Nations' activities as the policy of the League is *not to undertake what national institutions may well achieve but to assume* those tasks of common interest which are without the possibilities of individual states and require international co operation

Détermination du titre en chlore de la solution-mère.

Calcul de la dilution à faire subir à la solution-mère pour obtenir la solution javellisante.

Contrôle de la régularité des opérations par détermination du titre de la solution javellisante.

Le contrôle bactériologique exercé régulièrement comprend la recherche du bacille coli, tant dans l'eau brute que dans l'eau stérilisée, par culture de 48 heures en bouillon peptone phéniquée et mise en évidence de l'indol.

Les prélèvements bactériologiques sont effectués à la sortie de l'usine et en différents points de la ville. Combinés avec la mesure de la résistivité de l'eau, ils permettent de vérifier l'efficacité de la stérilization, et le bon état du réseau de distribution. Quelques points défectueux dans les conduites causes de souillures locales ont pu être ainsi mis en évidence. Les municipalités aussitôt informées, ont pris les mesures nécessaires.

Nous donnons ci-dessous quelques résultats extraits des analyses de contrôle.

Dates.	Colibacille Par Litre.		Dates.	Colibacille Par Litre.	
	Avant sterilization.	Après sterilization.		Avant sterilization.	Après sterilization.
8–2–27 ..	250	0	28–2–27 ..	500	0
22–2–27 ..	250	0	8–4–27 ..	1,000	0
25–2–27 ..	1,000	0	14–4–27 ..	1,000	0
17–6–27 ..	250	0	2–5–27 ..	4,000	0
15–7–27 ..	100	0	16–6–27 ..	250	0
16–9–27 ..	700	0	16–9–27 ..	125	0

Les résultats obtenus, permettent de tirer les conclusions suivantes :

La stérilization de l'eau effectuée dans ces conditions avec des moyens forts simples, un prix de revient excessivement faible, livre une eau d'alimentation de bonne qualité.

Les caractères organoleptiques de l'eau ne subissent aucune modification.

Le contrôle des canalisations permet de mettre en évidence des causes de souillures locales, et d'y remédier rapidement.

Variation de la Polution.

	Saison sèche	Saison des pluies
Colibacille ..	100	750
Pyocyanique	0	400

Ces résultats montrent que l'eau de la nappe est peu minéralisee pauvre en gaz, et contient un nombre tres élevé de microbes, jamais inférieur à mille germes par cm et dont le nombre s'accroît au moment de la saison des pluies

Pour remedier à cette situation, la stérilisation des eaux d'alimentation de Saigon et Cholon fut décidée

Le procédé choisi pour sa facilité d'application fut la stérilisation par l'hypochlorite de chaux.

La mise au point du procédé fut effectuee par monsieur Guillerm Chef de Laboratoire à l'Institut-Pasteur de Saigon et Monsieur Méchin Ingénieur des Ponts et Chaussées

La disposition de l'usine des eaux ne permettent pas une sulfitation apres chloration, il était impossible de pratiquer la stérilization avec de fortes doses de chlore Après essais, la javellisation avec la dose de chlore juste égale à celle déterminée par le test chlore de Diénert fut adoptée Disons de suite que cette dose oscille de Om/gr. 2 à Om/gr 6 de chlore libre par litre d'eau

L'appareillage nécessaire, très simple se compose de 3 cuves superposées et d'une cuve à niveau constant.

Toutes ces cuves sont munies de dispositifs appropriés pour l'évacuation des boues.

La première cuve sert à préparer la solution-mère de chlorure de chaux, la deuxième, par dilution de la solution-mère permet d'obtenir la solution javellisante dont le titre dépend du test chlore de l'eau à traiter, la troisième cuve plus petite sert de réserve temporaire.

La cuve à niveau constant a pour but de donner un débit de solution javellisante proportionnel au débit d'eau brute à traiter.

Elle est munie d'un flotteur en verre, entraînant un levier pivotant autour d'un axe horizontal, commandant le débit de la solution provenant de la 2° cuve, et d'un ajutage mobile verticalement dont le déplacement permet de tenir compte des variations du débit d'eau brute.

Cette installation simple et robuste, facilement conduite par un indigène, s'est révélée à l'usage parfaitement adaptée à son but.

Les différents contrôles chimiques et bactériologiques s'effectuent à l'Institut-Pasteur de Saigon.

Ils comprennent :

Détermination du test-chlore de l'eau brute.

forests were of no use to anybody, and the mountain regions abundant with minerals and coal could not attract attention of the exploiters for the lack of means of transportation. The Chinese Eastern Railway from the very first years of its existence gave an intensive impulse to the agricultural development and was the most important cause of the colonization of north Manchuria by the peasants of southern China.

The isolated north Manchuria, with the whistle of the railway engine, awoke quickly from its long sleep and began to be occupied by the settlers from all over China, and the population of north Manchuria within the succeeding 20 years grew steadfastly until it reaches now over twenty millions (about 33 men per square mile). Colonization of north Manchuria, judging from its present rate, will in course of ten to twenty years populate the whole of the extreme north and west of Manchuria where the farms are yielding rich crops and where there are considerable amounts of unoccupied lands.

Notwithstanding that the population in north Manchuria is comparatively small, north Manchuria produces not only enough to feed itself, but begins to be the country with considerable exports. The Chinese Eastern Railway, being the continuation of Trans-Siberia Railway, cuts across the whole of north Manchuria and connects the whole western Siberia with the Far East, and is the only through railway line which gives access by land from the every important point of great China and Japan to western Europe.

The main occupation of the population of north Manchuria is agriculture, and only a small part of the population is occupied in the industry, and a still smaller portion is occupied in breeding cattle.

The Climatic Conditions of North Manchuria.

The climatic conditions of north Manchuria approach the Continental. The summer is quite hot and the temperature very often reaches 40°C. The hottest period begins in July and ends in August. The winter is quite cold, there are periods when the temperature drops as low as 35°—40°C., with considerable falls of snow, which sometimes reach more than three feet deep. The negative side of north Manchuria's winter are the frequent winds when even the little frost is keenly felt. The rainfall in the year exceeds 12 inches. The most of the rainfall is in July and August.

The Medical Service on the Chinese Eastern Railway.

The Chinese Eastern Railway, from the very beginning of its construction, attracted great masses of workers, who began to settle along the line of the railway. At the same time the railway administration, being compelled to organize a medical service not only for the railway workers but also for the outsiders, had to build its organization in much greater proportion than it required for its own use.

The medical and sanitary organization of the Chinese Eastern Railway, beginning its activities in 1898, when there were only few physicians and

THE ACTIVITIES OF MEDICAL AND SANITARY ORGANIZATION OF THE CHINESE EASTERN RAILWAY ADMINISTRATION IN NORTH MANCHURIA IN COMBATING THE EPIDEMICS OF PLAGUE AND CHOLERA, 1910—26

BY

WEI LIKUN,

Head of Medical and Sanitary Department of Chinese Eastern Railway Administration, Harbin, China

General Outline

The object of the present report is to acquaint the Seventh Congress of Tropical Medicine with the activities of the medical and sanitary organization of the Chinese Eastern Railway, which organization, being the only medical institution on the Chinese territory with definite epidemiological plans and regulations, played an important rôle in stamping out the plague and the cholera epidemics in north Manchuria and thus stood guard against spreading of these epidemics further east, south and west

In order to define the extent of the activities of the medical and sanitary organization of the Chinese Eastern Railway in its campaign against the plague and cholera in north Manchuria, it will be necessary to make a short sketch of the development of the activities of the railway in general and the influence which it exercised over all sides of economical life in the railway zone and the settlements adjacent to it

The campaigns which were lodged by the Chinese Eastern Railway medical and sanitary organization against the plague and cholera in north Manchuria have, without doubt, played a serious part in preventing the spreading of the epidemics on the territory adjacent to north Manchuria and thus created a strong barrier for the movement of plague from south-west to east, and f cholera from south-east to west

Economical Development in North Manchuria

During the 25 years of its existence the Chinese Eastern Railway, from the military and strategic railway, as it was intended by the builders to be, turned into a serious factor of cultural development of north Manchuria.

North Manchuria, with its enormous natural resources, before the construction of the railway was as if in an eternal sleep. Vast fertile lands and unbounded

At present the railway, which is over 1,821 kilometres in length, has 14 medical districts with hospitals fully equipped with modern appliances and with a sufficient number of medical specialists.

The largest hospitals are situated in Harbin, Hendauchedze, Manchoulia, Hailar, Buchedu, Fulaerdy and Pogranichnaia.

Of all the hospital personnel which amounts to 559 men, 36 are physicians, 67 feldshers, 67 midwives, 18 nurses, 15 chemists, 5 dentists, 1 röntgenologist, 45 are administrative personnel and 320 attendants. Besides these, there are 12 school hygiene physicians.

To illustrate the activities of the Chinese Eastern Railway organization for the last few years, we deem it necessary to show some figures of its activities in 1925 which are typical.

Diagram 1 shows that all the hospitals of the railway in 1925 admitted 10,356 patients which spent there 206,867 days. Of all the 10,356 patients about 16 per cent were of Chinese nationality and 84 per cent belonged to the European races.

The 14 medical districts attended to 163,473 dispensary patients which, in total, made 355,762 visits to all the dispensaries of the 14 districts

The Prevalence of Contagious Diseases on the Chinese Eastern Railway, 1925.

In order to show the prevalence of contagious diseases on the Chinese Eastern Railway zone, we give the figures of 1925.

In 1925 the total amount of the infective diseases on all the railway lines reached 3,219 cases. If we take into consideration that the population of the railway zone reaches at present 300,000, then the percentage of contagious diseases to the whole population will be little over one per cent.

Diagram 2 indicates that out of all the infective diseases, whooping-cough occupies the first place, giving 775 cases or 27 per cent, measles occupies the second place, 768 cases or 23 per cent, scarlet fever 531 cases, 16 per cent, variola 7 per cent, dysentery 7 per cent, the same percentage for typhoid fever. All the other contagious diseases vary from 1 to 4 per cent. Of all the 3,219 cases of infective cases, only 7 per cent belong to patients of Chinese nationality.

Diagram 3 shows the seasonal prevalence of the contagious diseases. The contagious curve indicates that the infective wave rises during the summer months, when 39 per cent of all the infective cases take place. In autumn the curve gives a considerable fall, when we have only 23 per cent of all the infective cases. Only 16 per cent of infective diseases occur during the winter months.

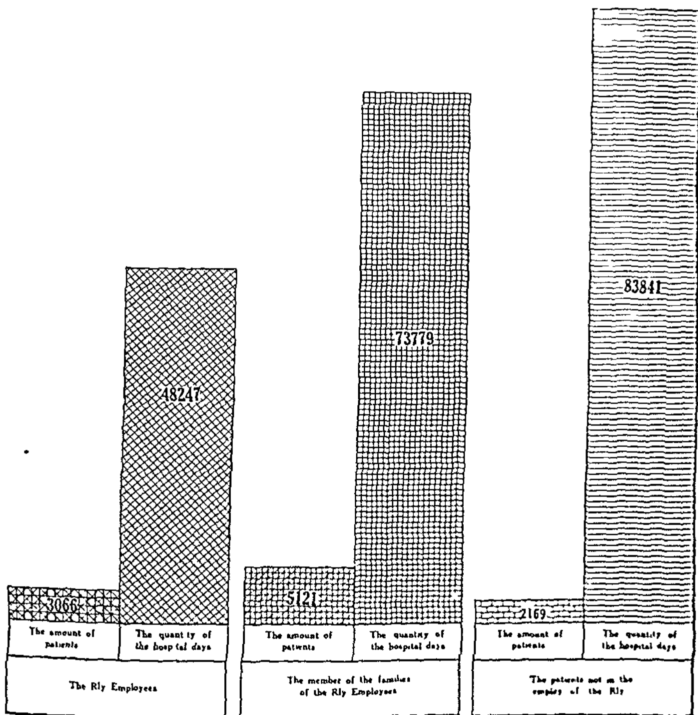
The expenditure of the Chinese Eastern Railway on the medical and sanitary service in 1925 is as follows:—

On the average during the last seven years, every year 1,048,004 roubles have been expended for every kind of medical help, that is, 38 roubles were spent yearly on every employee of the railway, and taking into consideration the members of the families of the employees, 15 roubles were spent per head.

one hospital, in course of 20 years has grown to be a substantial organization with a systematic net of hospitals and an adequate number of personnel

DIAGRAM 1

The groups of patients admitted to all the hospitals of the Chinese Eastern Railway in 1925



Total 10,356 patients Hospital days 206,[illegible]67.

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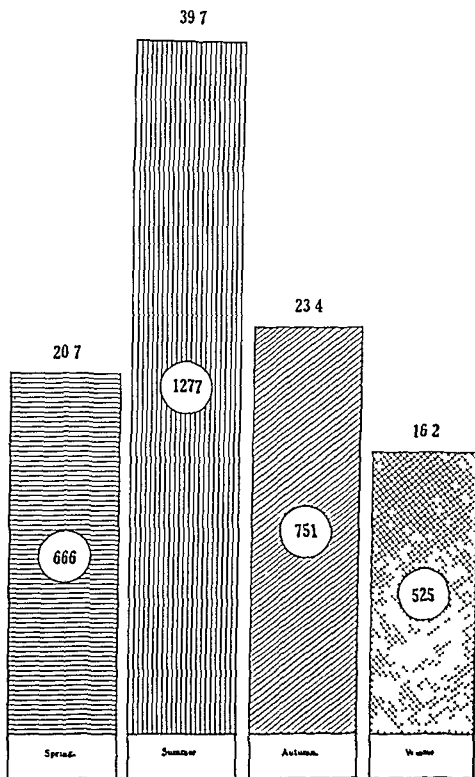
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Diagram 2

Table of infectious diseases by seasons, 1925



Total 3,[illegible]

DIAGRAM 3.

The monthly incidence of infective diseases on the Chinese Eastern Railway in the year 1925.

560
520
480
440
400
360
320
280
240
200
160
120
80
40

January February March April May June July August September October November December

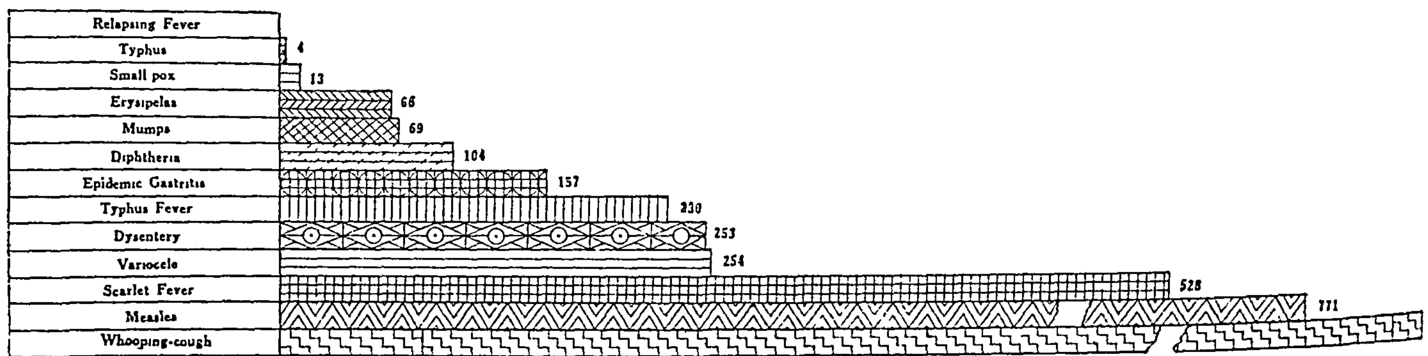
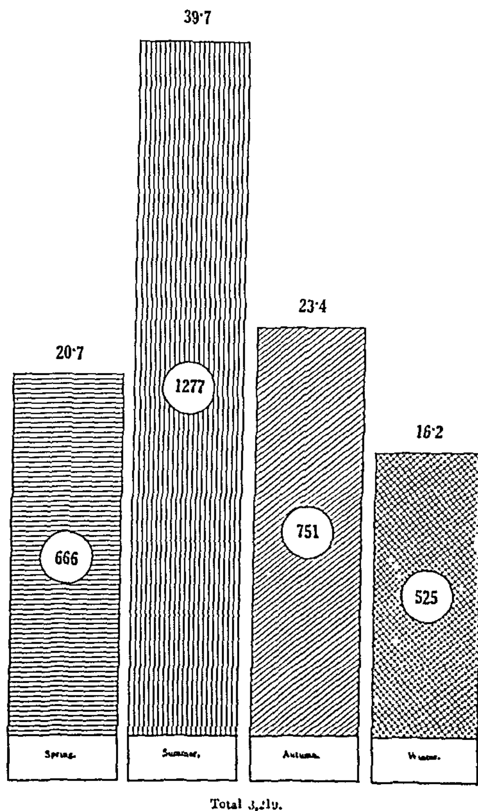


DIAGRAM 2.

Table of infectious diseases by seasons, 1925.



Total 3,219.

The Plague of 1910-11.

The first plague which caused great damage to the country appeared from Transbaikalia in 1910 and in a very short time spread all over north Manchuria and penetrated as far as central China. During the three months of its existence the plague killed on the territory of Manchuria and central China over 60,000 men.

The medical and sanitary organization had to fight the plague epidemic of 1910 in extremely unfavourable conditions; on one hand the Chinese adjacent population had no medical organization and there were no sanitary installations of any kind in the Chinese towns and villages situated near the railway. On the other hand the plague attacked the most uncultured masses, who lived in very unsanitary conditions. The work was much harder yet because the medical and sanitary organization had no experience in combating plague in such large proportions. And then again there were no rules and regulations, which would empower the medical personnel employed in the epidemic, and which would greatly lighten the struggle with the plague. The next negative side of the anti-plague campaign was the extremely unsanitary condition of the Chinese over-populated towns and villages. Further, the work was greatly complicated by the great over-population of the Chinese towns, where there was a great insufficiency of houses and habitations. And if we take into consideration that the density of population lead to close contact of the healthy with the plague attacked, resulting in the absence of spare houses where the occupants of the infected house could be evacuated, it will be clear that, notwithstanding the heroic preventive measures enforced by the medical and sanitary organization of the Chinese Eastern Railway, the plague continued its course. Although the plague came to north Manchuria by rail, it did not develop to any great extent in the railway zone, but began to spread in the adjacent town to Harbin in Fuchiatien. Fuchiatien has grown up during the construction of the railway and when the plague began there were about 35,000 population. The inhabitants of Fuchiatien consisted mostly of workers and small pedlars. As was cited before the density of the population was great.

If we take into consideration that the maximum of the average Chinese labourer's wages amounted to 30 cents a day, we can easily imagine the quality of the food of the Chinese workers.

It should be noted that the construction of the railway attracted far greater masses of coolies than the construction could utilize, and therefore the competition which arose among the workers was the reason of the low wages paid to the railway employees.

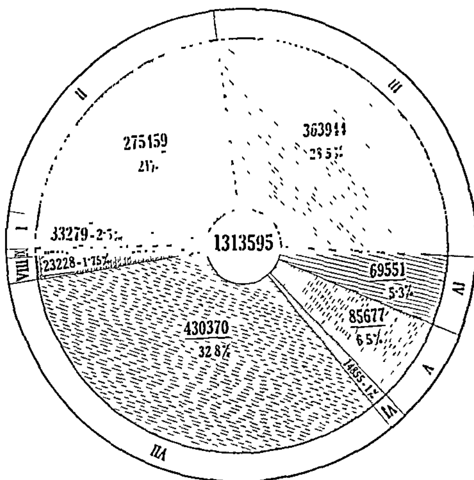
Owing to the fact that in north Manchuria there were no other industries which could employ the surplus workers, there arose a famine which weakened to greater extent the resistance of the workers to the epidemic.

The administration of Fuchiatien had to organize the feeding of the hungry. The cold winter of 1910, insufficiency of food, the great over-population of the

Out of this sum 420,000 roubles or 42 per cent were spent for the upkeep of the employees (salary, renting, etc.). The second place in the expenditure is occupied by the fuel for the hospitals 110,526 roubles, in the third place stands the feeding of the patients 102,000 roubles, then comes the expenditure for medicine 100 000 roubles and so forth.

Diagram 4.

The special expenditure of the Chinese Eastern Railway Administration in connection with combating the plague of 1910 11



I, II.—Personal expenditure.
III.—Renting and repairs of building.
IV.—Organization of the plague observation and isolation wards
V.—Disinfection.
VI.—Anti plague inoculations
VII.—Office expenses, publications and other organization expenses.
VIII.—Medicine.
IX.—Administration expenses.

In addition to all this expenditure, special sums were expended on the epidemic campaigns. For instance the plague campaign of 1910-11 cost the railway 1,313,595 roubles.

Chinese towns, the absence of any kind of medical and sanitary organization, these are the real reasons for such a rapid spread of the plague in 1910.

The quick spreading of the epidemic naturally created a panic amongst the population and, as a result, the people began to leave Fuchiatien and other cities in a hurry in every direction. In a short time the plague appeared in Harbin, Pristan, and in New Harbin, and from here it began to move south and east.

At the very beginning of the plague a special central committee to combat the plague began to functionate. At the same time a special town committee began to work, and these two committees co-operated in accordance with a specially drawn programme.

This programme consisted of the following clauses :—

(1) The organization of the plague barracks, isolation and observation stations.

(2) The division of the town in eightepidemiological districts for the purpose of sanitary observation and inspection.

(3) The disinfection of infected premises and things and to destroy by fire property of small value compensating the owners of the same.

(4) The invitation of the necessary epidemical personnel.

(5) The cleansing of the town and villages in the epidemical zone.

(6) The reading of popular lectures for the masses to acquaint them with the methods of personal prophylaxy.

(7) The issue of the popular publications in Chinese and Russian for the purpose of acquainting the population with the character of the epidemic.

The whole of the medical and sanitary organization took an active part in combating the plague, and as the epidemic increased the personnel of the organization gradually grew. When the epidemic was at its maximum, the personnel reached 618 men.

It must be said that the preventive measures took on considerably larger proportions after Professor Zabolotny arrived from Russia and Dr. Wuliente from Peking.

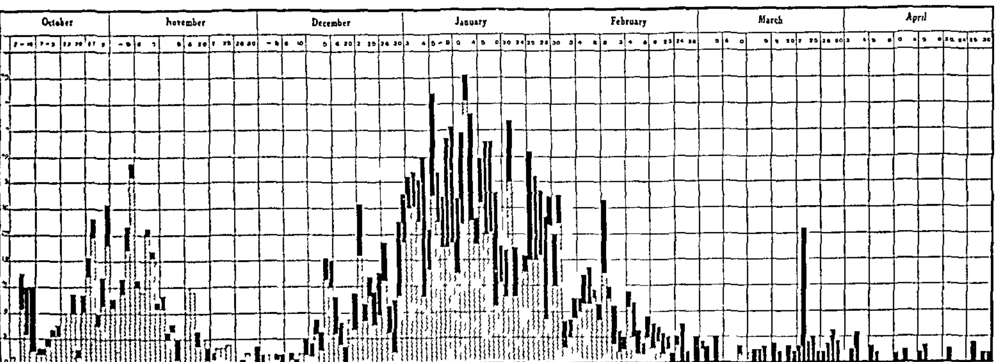
Professor Zabolotny and Dr. Wuliente helped the central committee to work out a detailed campaign against the plague. To fulfil these plans substantial financial sums were needed, and the Chinese Eastern Railway administration willingly met all the expenses, and thus all the resolutions of the central executive committee were strictly enforced.

The central executive committee invited a special bacteriologist for systematical diagnostical purposes, and from this origin of the bacteriological laboratory the research work connected with the epidemiology of the plague begins. At the same time the central executive committee invited assistant physicians for every medical district and organized special observation stations in the poorest districts in Harbin and Fuchiatien.

Every medical district had at its disposal a free dispensary. Then an institute of sanitary inspectors was established and each inspector had to take care of not more than thirty houses. In districts which were considered very dangerous,

DIAGRAM 5

The plague in the zone of the Chinese Eastern Railway, 1910.



The central executive committee having in view that the victims of the plague as a rule were the unemployed, passed regulations expelling them from districts infected by the plague.

For the extermination of rats, special detachments were formed, which worked during the whole of the epidemic.

To isolate the people that came in contact with plague patients, an observation isolation station was organized. The Chinese Eastern Railway reserved to the central executive sanitary committee 149 freight cars specially adopted for the observation and isolation. This observation and isolation was adequately supplied with medicinal suppliers and a personnel which consisted of two physicians, seven assistant physicians, four nurses and 39 attendants. Each car could accommodate about 25 men.

All the people that were submitted to observation were fed by a special kitchen where 14 cooks were employed. Every one taken to the observation station was obliged to remain there not less than seven days. In cases when a plague case was detected in the observation car, the sick were removed to hospital and all others from this car were removed to another car, where they had to stay seven days more. At the end of the observation all the people were sent out of the Chinese Eastern Railway zone.

During the period of the epidemic, that is, in November, December and January, 10,114 men were submitted to observation of which only 215 were Russians, the rest being Chinese. Out of all those submitted to observation, 64 cases of plague were diagnosed and removed to hospitals.

A well organized observation station and its harmonious internal work gave the possibility to detect plague cases, remove them in time to hospitals and thus to prevent the plague from spreading amongst the people at the observation station and to the adjoining settlements.

The Plague in 1920-21.

The plague of 1920-21 was preceded by occasional plague outbreaks in a few places in Transbaikalia.

The first outbreak of plague was registered in Hailar not far from the station Manchuria in October 1920. Seven cases of plague were then registered amongst the Chinese who were marmot hunters. In a short time plague cases were discovered within a mile from Hailar among the Chinese soldiers stationed there, and then the plague appeared amongst the railway employees in Hailar.

In November the plague attacked Mrs. Tarelkina and her three children, all of whom died in a few days. All these cases seemingly were of bubonic nature. In December the plague reached old Hailar, where to the end of January over 50 plague corpses were found.

From Hailar the plague moved to Chalainor coal mines. Chalainor is the great coal mines centre of the Chinese Eastern Railway and where over 5,000 coal mines are concentrated, here the plague rapidly reaped a rich harvest. In January

special medical sanitary detachments with special instructions for their work were organized Special disinfection units were formed for the purpose of the quick disinfection of the infected things and premises

The town hospitals were considerably increased, and all the plague personnel was instructed in the rules of transporting plague patients to all the special hospitals

The main activity of the central executive committee consisted in the upkeeping of sanitary condition of the town and the railway enforcing the preventive measures in all the densely populated settlements

Medical epidemic personnel was instructed to take the temperature of all the workers of all the industrial factories situated in the plague zone as well as of all the passengers travelling on the Chinese Eastern Railway

To define the sanitary condition of all the industrial factories situated in the plague districts a special card was drawn up which after being filled gave a full idea of the sanitary condition of every factory and the territory surrounding it Besides this special investigation of living houses was made and revealed the terrible want of sanitation in the majority of Chinese dwellings A special card for registration of the plague patients also contained the sanitary condition of the house where the plague case occurred

The next anti plague measure enforced was the anti plague inoculations From the very moment of the arrival of Professor Zabolotny and Dr Wuliente the central executive committee organized five inoculation stations During the epidemic 8 685 anti plague inoculations were made It is necessary to mention that the population at the start did not believe in anti plague inoculation and did not submit to them very willingly But after a series of lectures by Professor Zabolotny and Dr Bogutzky the population came with greater eagerness

In the chain of anti plague measures we attribute great importance to the institution of sanitary guardians which was introduced by the committee at the very beginning of the work *These sanitary guardians were appointed from* amongst the house owners or the tenants These sanitary guardians were obliged to do the following work (1) they were responsible for the regular cleaning of the yards closets and for timely removal of all the sewage and dirt, (2) they had to supervise in a sanitary way the markets where products of nutrition and drinks were sold, (3) the guardians were obliged to take care that the workshops were kept in satisfactory sanitary order as well as the premises where the workmen lived, (4) the sanitary guardians had to take care that the means of transport of food stuffs was satisfactory from the sanitary point of view, (5) in order to supervise the health of all those who live in the district, the sanitary guardian was obliged to examine every house daily and make enquiries about the health of the inhabitants, and at the same time acquaint dwellers with the prophylactic measures to be enforced against the plague, (6) the sanitary guardians were obliged in every possible way to better the sanitary conditions of the poorest people and to improve their nourishment

The plague of 1920-21 beginning on 20th October, 1920, lasted till 27th May, 1921, and compared with the plague of 1910 was of a longer duration because the epidemic of 1910 lasted only three months.

During the whole period of the epidemic in 1920-21 in the territory of the Chinese Eastern Railway, 1,976 plague cases were registered, and 2,553 plague corpses. Therefore the total sum of the victims of 1920-21 plague was 4,529, out of which 4,179 or 92 per cent were of Chinese nationality and 350 or 6 per cent Russians.

The largest number of plague cases occurred in March, when it reached 1,500.

In April the curve of the epidemic begins to decline and the number of plague cases falls to 1,300. In May the curve shows a rapid fall and at the end of the month the epidemic disappears.

Diagram 7, showing the prevalence of the epidemic in the Chalainor coal mines and in Manchuria by days, illustrates that in both these places the plague claimed the most victims in February.

If we look at the map of the Chinese Eastern Railway we will see that the greatest number of plague cases registered and dead bodies found were in Fuchiatien, where the number of plague victims reached 2,381. Harbin gave 1,218 plague cases. The third place was Manchuria, where 1,144 places were registered. Manchuria is followed by the Chalainor coal mines where 938 people died from plague. In the town Chubianze 266 plague cases were registered, in Tzitzikar 167, in Hailar 100, Station Imanpo 60, in all other places the number of plague cases did not exceed ten.

According to the report of Dr. Wuliente, the total number attacked in 1920-21 in all China reaches 8,503 cases.

It is worthy to remark that all the Europeans who succumbed to plague belonged to the poorest classes, who lived in the same unsanitary conditions as the Chinese, and often lived together with them. Only very few that died of plague, Chinese and Russian, lived in satisfactory sanitary conditions.

During the epidemic, out of all the plague personnel, only one physician, four feldshers and 29 attendants died.

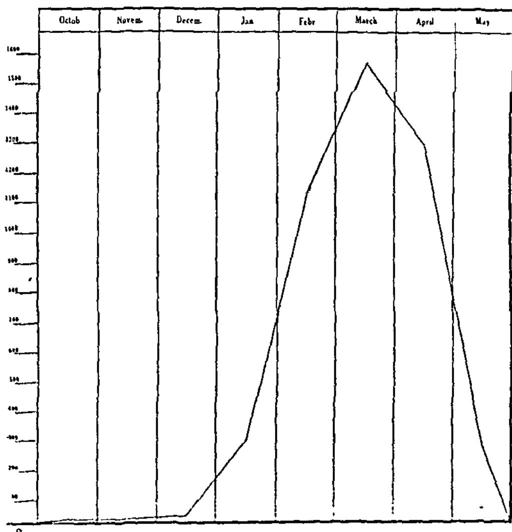
Directly after the appearance of the first cases of plague, the central sanitary executive committee was formed with the general manager of the Chinese Eastern Railway as a chairman. The committee in order to localize the epidemic had to enforce extraordinary measures. A medical detachment, consisting of two physicians, four feldshers and ten attendants, was despatched to Hailar where the plague originally appeared. This detachment fully co-operated in its work with the Chinese doctors sent to the same place by the chief physician in charge of the North Manchurian Plague Prevention Service, Dr. Wuliente. The chief object of this detachment was the scientific investigation of the origin of the plague and the methods to be adopted to check its spreading.

The committee then passed an ordinance to the effect that all the passenger trains going east to Harbin and further south should be accompanied by sanitary

222 men died, and up to 20th February, 558 men succumbed to the disease. In February the amount of plague deaths reached 80 men per day. The plague epidemic was now exclusively of a pneumonic character, attacking mostly the poorest Chinese coolies. From Chalainor it moved to a settlement near the station

Diagram 6.

The incidence of the plague epidemic along the line of the Chinese Eastern Railway in the years 1920-21 *by months.*



Total 4,529.

Manchuria, where from the middle of January to 20th February, 1,111 people including 331 Russians died of plague. From Manchuria it turned to Tzitzikar, where it claimed 1,734 persons, and then to Fulaerdi and Buhedu.

In January plague appeared in Harbin and at last in Fuchiatien.

cars with adequate medical personnel, so that in time of necessity prompt medical aid should be rendered.

For the purpose of acquainting the population of north Manchuria with the character of the epidemic and about the prophylactic measures against the plague, a leaflet in Chinese and Russian was published and distributed in great numbers among the working classes. In Hailar a special plague ward was organized on the territory of the hospital and an observation station began to work.

In Hailar a subcommittee was formed to supervise the work against the epidemic and sufficient financial allowances were made to it by the central committee. When the epidemic reached Manchuria there also a subcommittee was organized, financed by the central executive committee. The Manchurian subcommittee immediately organized an observation ward and did lose no time in searching the whole vicinity for the plague sick as well as for the corpses. All these measures did not immediately check the epidemic and plague reached Chalainor. Orders were given to organize the subcommittee there, which, anticipating the great danger to the great number of the workers employed in the Chalainor coal mines who were living in very insanitary conditions, immediately began to mobilize all the local resources to combat the pest. Special plague wards and observation and isolation stations were promptly organized. Special sanitary investigation and inspection of the miners, houses and dwellings as well as all the territory in the vicinity were undertaken and rapid steps were taken to clean and disinfect the most dangerous premises.

In connection with the appearance of the plague case in Harbin and Fuchiatien, the central executive committee had to enforce the following extraordinary measures:

(1) The railway was not allowed to sell tickets for the trains going from west to east, with the exception of those who had medical certificates stating that they were healthy.

(2) An observation station was organized not far from Fuchiatien, which consisted of 25 goods cars, fully medically equipped with adequate medical and epidemic personnel.

(3) In view of the rapid increase of the number of plague cases and the railway authorities not being able to prevent in many cases ticketless passengers boarding the trains, an order was issued to stop all passenger traffic between Manchouli and Harbin.

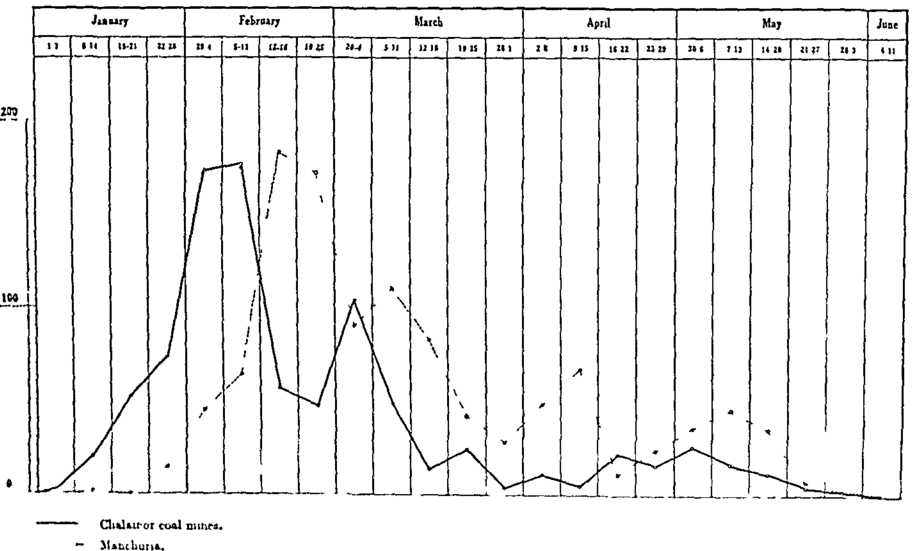
(4) On all the most dangerous stations subcommitees were brought to life, which organized special observation wards. The medical personnel as well as all the necessary funds were supplied by the central sanitary executive committee.

(5) An ordinance was passed by the central executive committee that all passengers going from west to east had to undergo a five days' quarantine at the specially organized station at Anda, where special epidemical personnel was enlisted.

Another quarantine of the same nature was established on the southern line at the Station Kuanchenszi.

DIAGRAM 7.

The incidence of the plague epidemic in the district of the Station Manchuria and the Chalainor coal mines in the year 1921 by weeks



(6) In accordance with the agreement with the Director of the North Manchurian Plague Prevention Service, Dr. Wuliente, all the Chinese plague suspects and the corpses were sent to the Fuchiatien hospital, and all the Europeans to the infective ward of the municipal hospital.

(7) A special railway epidemiological detachment was organized for the purpose of searching the most dangerous districts for suspects and transporting them to plague hospitals and contacts to the observation stations.

During the epidemical period the railway administration reserved 386 freight cars for the purpose of observation of the plague contacts.

The administration of the small Chinese settlements which were in the railway zone received substantial financial, medical and other help in their fight against the plague.

To instruct the people in prophylactic measures against the plague, systematic lectures were read in Harbin and along the line of the railway. These lectures were illustrated by placards, diagrams and films.

Besides all these preventive measures, special inoculation detachments were working in all the most dangerous regions up to the end of epidemic.

In order to make all the anti-plague measures more effective, the central sanitary executive committee in every district in Harbin as well as in the adjacent settlements appointed sanitary guardians (inspectors). These sanitary guardians together with the representatives of the inhabitants had to enforce the following anti-plague measures:

(1) The sanitary guardians had to instruct the dwellers of their regions about personal and public hygiene and how to check the spreading of plague.

(2) The sanitary guardians had to take measures to organize the free feeding places for poorest population of their regions and use every means possible to support the needy, by improving their living conditions.

(3) Sanitary guardians were obliged to make daily enquiries in every house and dwelling in their region about the health of all residents for the purpose of prompt attendance to the plague suspected and their quick transportation to the hospitals.

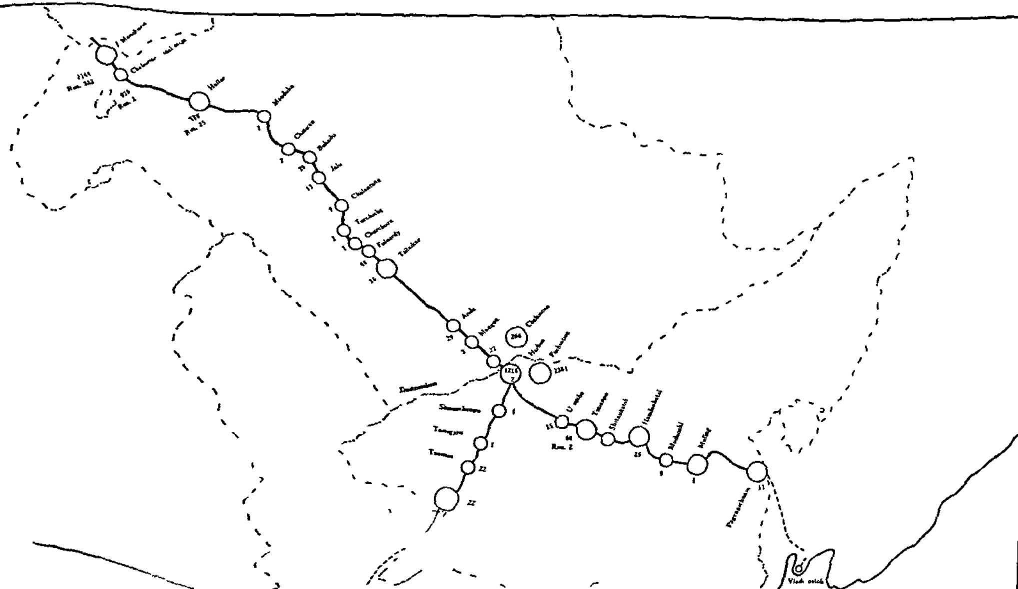
(4) The sanitary guardians were obliged to make systematic and periodic sanitary inspections of their regions and take immediate steps to dispose of all the dirt and rubbish in their regions.

(5) The sanitary guardians had to inspect all the market and sale places, where products of food were sold; as well they had to inspect all the institutions where the objects of food were prepared and take measures, for them to be kept in proper sanitary order.

(6) Sanitary guardians were obliged to make periodical inspections of the waterworks and all the wells and other water supply places and were held responsible for their sanitation.

DIAGRAM 8.

The plague epidemic in the zone of the Chinese Eastern Railway in 1921.



The first cholera patients in 1902 were registered on the 18th of June, and from that date cholera quickly moved in all directions along the line of the railway.

The main points where the cholera got most victims were Harbin, Pristan, New Harbin, Hailar and Imanpo.

Within the whole epidemical period 1,658 cholera patients were registered, of which 930 men died (56 per cent). Out of all the cholera cases 1,050 were of Chinese nationality and 608 Russians.

At the time there was not a single Chinese or European doctor in the settlements adjacent to the railway zone, and the population numbering over 100,000 were helpless medically. And as there were no statistics of any kind, we may with certainty say that the number of cholera victims was much greater than what we have just stated.

At the beginning of cholera, in 1902 the central epidemical committee, being alarmed at the rapid development of cholera, which threatened the normal construction of the railway, had to enforce all the preventive measures which the conditions at that time allowed. The medical personnel of the railway was insufficient and additional staff was enlisted numbering 12 physicians and 87 feldshers. Consequently the total personnel which took an active part in exterminating the cholera of 1902 amounted to 271 men.

In 1902, when the construction of the railway was not yet ended, the passenger traffic was not opened and there were no special sanitary cars for the transportation of the sick. During the epidemic it became necessary to use 27 goods cars for the transportation of cholera patients. As the cholera developed and began to threaten more and more to stop the work of construction, special cholera wards in 23 different points on the line were organized which could accommodate 290 cholera patients.

A special inspection of all trains coming and going was instituted for the purpose of detecting cholera suspects and sending them to special hospitals. Besides, an inspection of all the boats sailing on the river Sungari was undertaken and all the sick and suspects were attended to.

Within the four epidemic months the largest number of cholera cases were registered in June. In July the cholera lowered its rate, in August the cholera gave an extreme decline, and in September and October there were only a few cholera cases registered in the Chinese Eastern Railway zone.

The central epidemic committee commenced its work from the very beginning of the cholera epidemic in 1902 and its practical activities consisted of:—

(1) Measures leading to thorough cleansing of epidemic regions, so that they would answer sanitary requirements.

(2) The enlistment of all the additional epidemic medical personnel.

(3) The acquirement of all necessary disinfectants.

(4) In all the most dangerous cholera regions special sanitary guardians were appointed to take charge not only of the sanitation of certain regions, but were entrusted with the transportation of the sick to the hospitals.

(7) Sanitary guardians had the right to insist on the fulfilment of all the lawful sanitary demands by all the owners of the houses and other buildings and institutions

In case the sanitary guardians' demands were not fulfilled, the latter reported it to the director of medical department of the Chinese Eastern Railway for further action

In May the plague all over the line gave an extreme decline, and at the end of May there were only single cases here and there

But the plague, crossing the eastern frontier to Vladivostok kept its pace there during the whole of May, and only in June the curve of plague in Vladivostok began to come down and finally ended in July the epidemic killing over 500 men

The prevalence of plague in Vladivostok and Ussuri District during June and July created uneasy feelings on the Chinese Eastern Railway and kept the medical and sanitary organization on guard all the time

Within the whole period of the epidemic the bacteriological laboratory made 540 analysis of all kinds of excretions of plague patients

The laboratory did not work on diagnosis of plague cases only but also did considerable scientific experimental and epidemiological investigations

Mobilization of all the medical resources of the Chinese Eastern Railway Administration, and close co operation with the North Manchurian Plague Prevention Service and its director Dr Wuliente and the experience obtained during the epidemic of 1910 11 were the fundamental causes why the plague epidemic of 1920 21 did not spread in such large proportions as it did in 1910 11

We may say that further plague outbreaks are possible but knowledge in the epidemiology of plague and the practical experience in the prophylaxis, which were acquired during these two epidemics, give us grounds to state that future plague epidemics will not move so easily and quickly as they did in the epidemic of 1910 11 and 1920 21

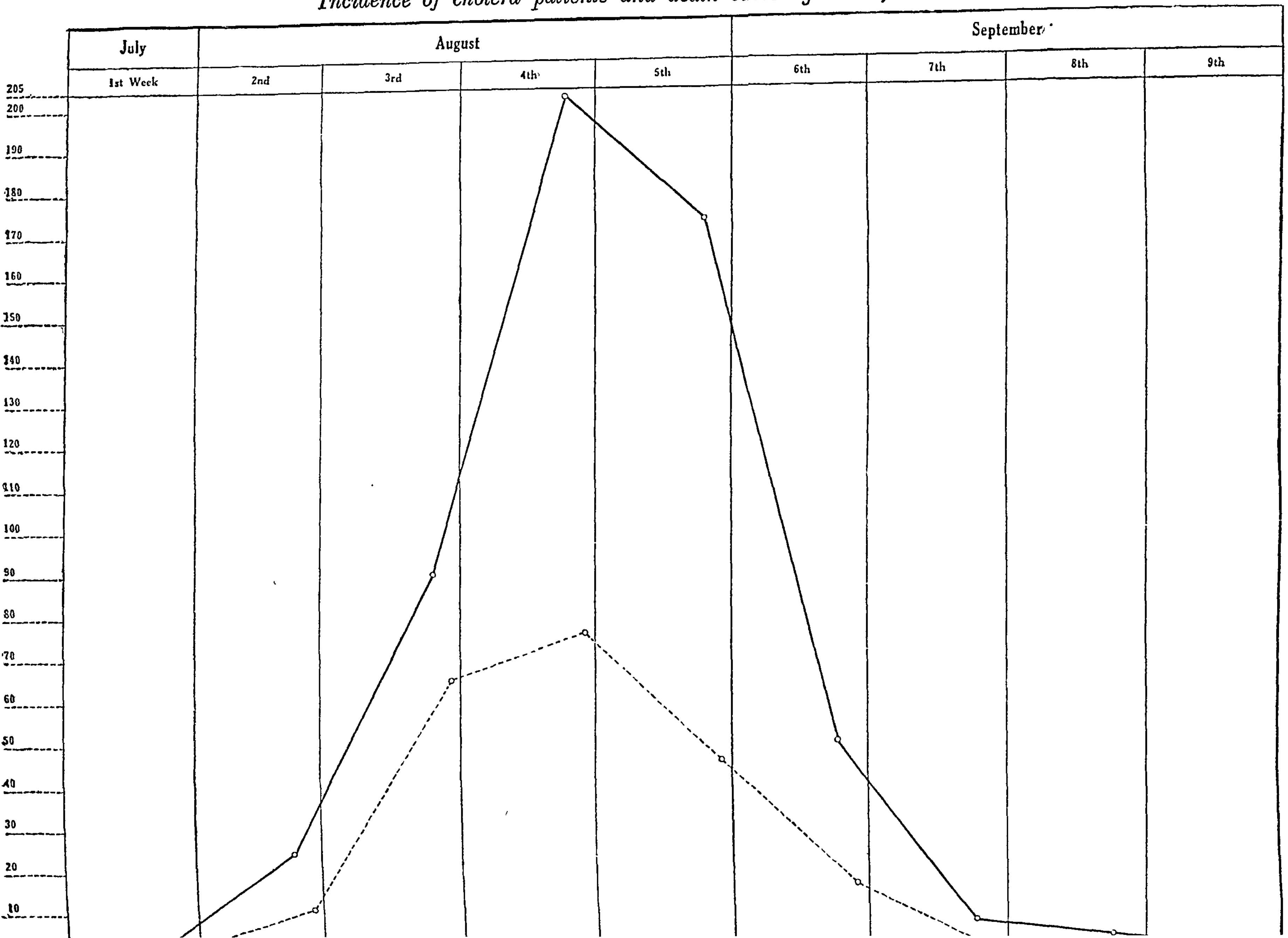
The Cholera of 1902

Since the period of the construction of the medical and sanitary organization of the Chinese Eastern Railway, epidemics of cholera visited north Manchuria three times

If in combating the plague the medical and sanitary organization and the administration of the railway were in difficulties in stamping it out at the outset, owing to the ignorance of the epidemiological moments of the epidemic and lack of practical experience the medical and sanitary organization, epidemics was fully prepared to meet the cholera armed with scientific methods of fighting it

The first serious cholera epidemic took place at a time when the railway was not fully constructed In 1902 cholera was brought to the zone of the railway by coolies from the post Inkow where, to the time of the appearance of the disease on the Chinese Eastern Railway, about 500 deaths had already been registered

Incidence of cholera patients and death cases by weeks, 1919.



(5) The central sanitary committee organized the systematic inspection of all waterworks, wells and places where water was taken for drinking purposes In case the water from wells was found unfit to drink, the well was closed, and the use of the water was forbidden

(6) In all public places only boiled water was allowed for drinking and for that purpose special barrels with cocks were stationed and the covers of these barrels kept under lock

(7) At all the stations along the line of the railway free tea was served to the passengers of all the trains

(8) The sanitary executive committee also organized the systematic inspection of all the trading places, where food stuffs were sold All trading stores that did not answer the sanitary requirements were closed

(9) For the burial of the dead a special cemetery was reserved

During the whole period of the cholera of 1902 the mortality of the medical personnel was insignificant, as only one physician and one feldsher succumbed to the disease

THE CHOLERA OF 1919

Seventeen years passed and cholera again visited the Chinese Eastern Railway zone The cholera of 1919 in its movement took the route from south to north Going slowly from southern Manchuria north it reached Harbin, where it reaped a good harvest

The cholera began its work in the end of July and ended in the end of September

In all there were 793 cholera cases registered in the Chinese Eastern Railway zone, out of which number 390 died, or 41 per cent

The majority of the cholera cases took place in Harbin, 603 cases

The cholera of 1919, beginning at the end of the last week of July reached its maximum in the second half of August

At the end of August the cholera curve gives a gradual decline At the beginning of September the cholera curve showed an extreme fall and in the end of September the epidemic came to an end

All along the line of the railway, at the 16 different stations, 190 cases of cholera were registered with 117 deaths, or the mortality on the line was over 62 per cent

Just as in the epidemic of 1902, the central executive sanitary committee worked all through the 1919 epidemic and its activities were as follows —

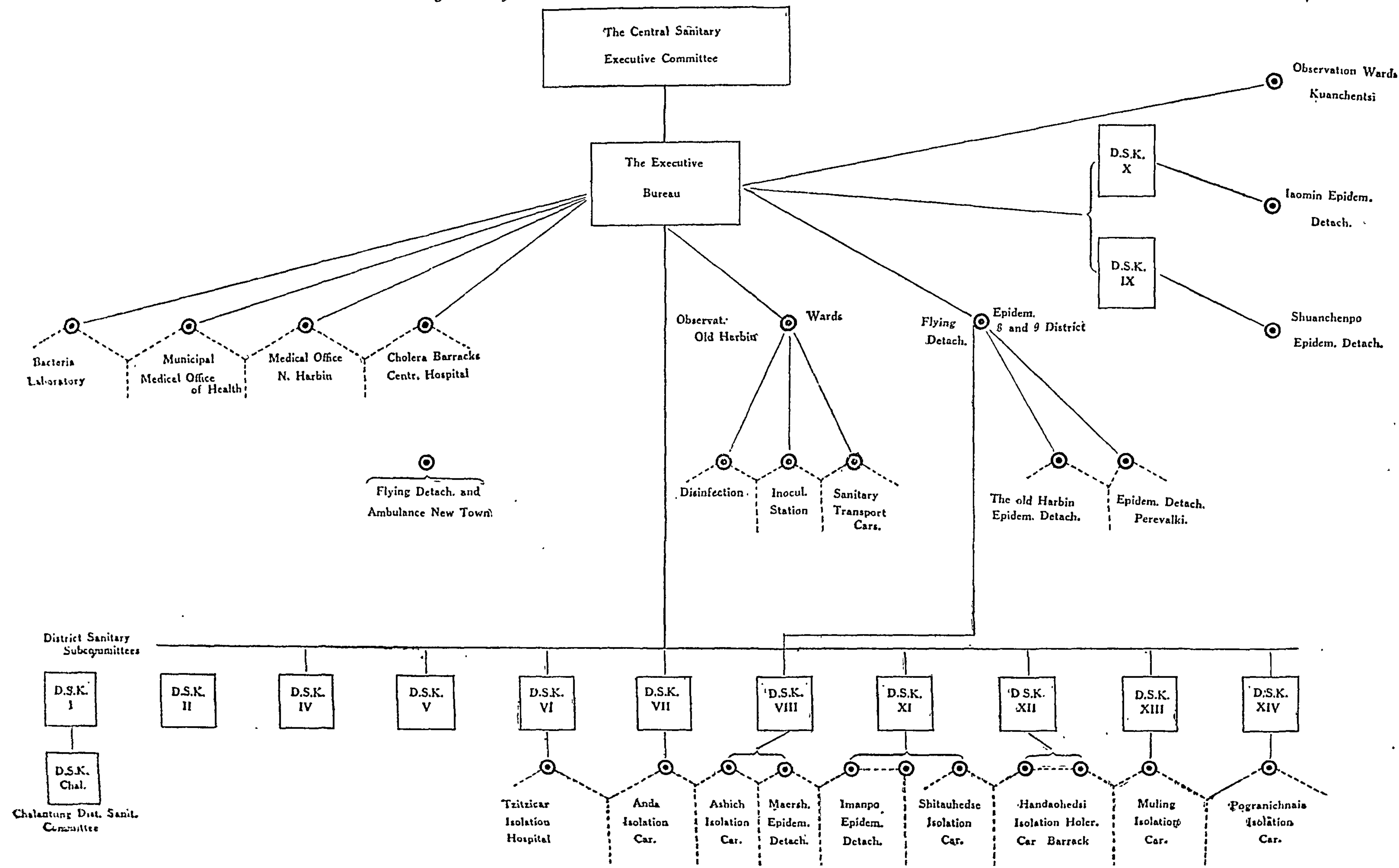
(1) As a prophylactic measure, a number of inoculation detachments were organized which inoculated all those who submitted to it against cholera

(2) Additional epidemic personnel was enlisted to work in the special cholera wards

(3) Special wards were opened for the hospitalization of all cholera patients

Diagram 10.

Diagram of the Medical and Sanitary Organization, 1926.



(4) Special measures were taken to bring all public places into sanitary order

(5) For emergency cases all passenger trains were accompanied by special sanitary cars

(6) A sufficient amount of disinfectant was acquired and distributed amongst the railway hospitals

(7) In all the important stations along the line a number of subcommittees with instructions to take all precautions that all the food sold along the railway line should be of good quality and destroy all products which the subcommittee considered were not suitable for consumption

The subcommittees were also instructed to enforce all the regulations and rules passed by the central sanitary committee for the purpose of checking the progress of cholera

The Cholera of 1926

The cholera of 1926, as the investigation showed, was not imported but seems to have originated in Harbin itself Beginning from the 11th of August and ending on the 30th of September, 56 cholera cases were registered on the territory of the Chinese Eastern Railway zone Out of this number 20 men died

In Harbin itself, 33 cases were registered of which 23 cases belonged to the line

As in the previous two cholera epidemics of 1902 and 1919, during the epidemic of 1926, the central sanitary executive committee commenced its work from the very day of the beginning of the epidemic

The striking feature of the epidemic of 1926 was the detailed plan of work, which consisted of the following —

(1) Fourteen medical districts and 14 subcommittees were organized for the purpose of prompt action in case of the appearance of the cholera

(2) A special cholera hospital was established in Harbin and one on the line

(3) Three emergency cholera detachments were formed for the purpose of prompt attendance to cholera patients and their transport to the special hospital

(4) An observation station with disinfection cameras was organized, one for Harbin and one for the line

(5) The bacteriological laboratory worked all the time doing diagnostic and research work on the cholera carriers Four hundred and eighty nine bacteriological analyses were made, besides the work connected with investigation of drinking water, bacteriologically and chemically In total, over 100 water analyses were made during the epidemic

(6) All the necessary additional personnel, consisting of seven physicians, 12 feldshers and 28 attendants, were enlisted who worked all through the epidemic in the special cholera institutions and laboratories

(7) One of the most important parts of the work of the central committee was the organization of mass anti cholera inoculations in places where cholera

the source of the plague epidemics, it is very essential to take steps to organize scientific research to prove that the above assumption is correct. In case systematic investigations should prove the above assumption, prophylactic measures against plague could be enforced with greater ease and success. This conclusion was arrived at by the Mukden International Plague Conference in 1911 and up to this time has not been realized.

(8) In combating epidemics and especially plague, the medical and sanitary organization, having great difficulty in finding the medical and sanitary personnel, which can understand the language and the conditions of life of the people, thinks it is time to establish a special medical college for the purpose of preparing an adequate number of native medical personnel which will meet the emergencies of epidemics with greater success, the successful campaign against which largely depends on the mutual understanding of the medical personnel and population of the country.

chiefly threatened In total, 16,583 inoculations were made during the whole of the epidemic

Conclusions

The brief history just outlined (of the struggle of the Chinese Eastern Railway with plague and cholera within the period of 25 years), shows that the medical and sanitary organization has gradually acquired experience in fighting the plague and cholera epidemics and comes to the following general conclusions —

(1) In fighting the plague it is necessary from the very beginning to have a detailed plan of the campaign with thorough consideration of all the epidemiological features and the prophylactic measures to be enforced

(2) It is absolutely necessary to base the work of campaigns on scientifical investigations and the practice gained from the previous epidemics

(3) The practical anti plague and anti cholera work has brought the medical and sanitary organization to the conviction that *it is absolutely necessary to* co operate in its work with all other sanitary and epidemiological organizations wherever they exist

(4) The medical and sanitary organization in its work during the whole epidemical period has come to the conviction that it is necessary to enforce the following prophylactic measures —

(*a*) The improvement of the housing conditions of the labouring population after thorough investigation

(*b*) Organization of mass feeding places and improvement in the quality of food

(*c*) Improvement of the conditions of work by organizing the systematic sanitary inspection

(*d*) Improvement of the sanitation of towns and cities, especially the improvement of waterworks and sewage

(5) Long experience in combating epidemics of plague and cholera shows that isolated measures in the zone of the railway will not only give atisfactory results but, only when identical measures are undertaken in adjacent settlements in close co operation with the railway administration, the epidemics will show a tendency to decline

(6) In combating plague and cholera, the organization found that the education of the masses is very essential and important It is necessary to take measures to instruct the masses by popular lectures, leaflets and placards about the epidemiology of the epidemics and the preventive measures against them

Only when the masses by instruction began to realize the importance of their co operation with the medical and sanitary organization and began to take active part in the campaign and stand guard against the epidemic, did the latter begin to decline, especially is this true of the plague campaigns

(7) In view of the uncertainty as to whether the tarbagan is liable to plague infection, and whether the epizootic amongst the tarbagans and other rodents is

au 7è Congrès de Médecine tropicale, les dix observations de l'emploi de pituitrine dans notre service.

Nous croyons que le médicament si discuté ne mérite ni cet excès d'honneur ni cette indignité ; et peut dans certains cas donner de bons résultats ; mais employé avec prudence et pas entre les mains de jeunes praticiens inexpérimentés, et cela malgré le jugement sévère qu'il a subi de la part du professeur Convalaire du Dr. Vallois du Dr. Wallich. Le professeur E. P. Davis a écrit aussi : la pituitrine est le médicament le plus dangereux qui soit entre les mains de l'accoucheur.

Le fait de pouvoir éviter le forceps le traumatisme et les déchirures assez fréquentes qu'il détermine est déjà un avantage indiscutable.

Dans les dix observations que nous présentons nous n'avons eu aucun accident. Comme Brindeau, Metzer, Jeannin nous n'avons employé l'hypophyse qu'avec une certaine réserve.

Contrairement au mode d'utilisation employé par le professeur Van der Hoeven de Leiden et du professeur Paucot nous n'avons jamais employé l'extrait de post hypophyse pour provoquer l'accouchement prématuré quand cette intervention très rare dans notre service a du être tentée. Nous nous sommes toujours borné pour déterminer l'expulsion prématuré du fœtus au décollement de l'œuf par une ou plusieurs sondes glycériné en gomme assez dure N° 18 ou 20 poussées à fond de course entre les membranes et la paroi utérine sans déchirer les membranes et nous avons toujours pu en 24 heures à 36 heures au plus tard parfois, plutôt, provoquer l'accouchement prématuré sans employer le ballon de Champetier de Ribes ou de Tarnier ou l'appareil de Démelin.

Voyez comment se présentaient nos parturientes et à quel moment du travail nous avons cru pouvoir expérimenter les injections de pituitrine.

Observation I.—Madame P., passé chargé,—1er entrée à l'Hôpital le 20 Mai, 1921, pour adénite de l'aisselle gauche, temperament délicat, très nerveux, a eu la fièvre typhoide, la scarlatine, régl étard, a souffert d'une phlébite du bras.—A eu de la dysenterie amibienne avec entérocolite persistante, foie augmenté de volume, douloureux, cystite ancienne, urine peu abondante.

2e entrée 13 Mars, 1926 ; elle vient de Hongay pour accoucher dans notre service, présentation O.I.G.P. la tête reste au détroit supérieur, après un travail long, la dilatation étant complète, elle reçoit une injection de pituitrine ; accouche après plusieurs applications de forceps le 11 Avril, d'un enfant du sexe masculin pesant 3 k 450, conserve un peu de cystite pendant quelques jours sort le 7 Juin guérie.

Observation II.—Madame B, âgée de 25 ans, entre le 28 Avril, 1920, accouche le 5 Mai, d'un enfant du sexe masculin à 0 h 25 pesant 4 k 830 en O.I.G.P., a reçu une injection d'hypophyse, la dilatation étant complète et la tête au détroit moyen. On s'était assuré au prèalable que l'urine ne contenait pas d'albumine et qu'il n'avait pas de lésion organique du cœur. Peu de temps après l'injection d'hypophyse donnée à 23 h 40, la tête s'engage lentement et la mère met au monde un enfant de 4 k 830 sans déchirure ; mere et enfant ont quitté le service bien portants le 20 Mai 1926 ; le travail avait duré 49h 25.

Observation III.—Madame F., I pare—présentation sommet position O.I.D.A. tête reste fixée au détroit supérieur, à 15 h 45 le 8 Avril après avoir reçu une injection de post hypophyse qui provoqua de fortes contractions utérines la tête s'engageait au détroit moyen et n'avançait plus. Il fut nécessaire de terminer l'accouchement par le forceps qui amène un enfant du sexe masculin, pesant 3 k 025, pas de déchirure, durée du travail 36 heures. La mère et l'enfant ont quitté le service le 18 Avril en bonne santé.

MATERNITY AND CHILD WELFARE.

DES INDICATIONS DE L'EMPLOI DES INJECTIONS DE POST HYPOPHYSE CHEZ LES PARTURIENTES EPUISEES PAR LES CHALEURS DE L'ÉTÉ DANS LE DELTA TONKINOIS

PAR

L. JOURDRAN

Medecin Chef de l'Hopital de Lanessan, Directeur Local de la Santé Publique au Tonkin

La période d'ete avec ses journées ou l'atmosphère chargée d'électricité pèse lourdement sur les habitants du delta Tonkinois pendant les longues heures de jour et de nuit pendant lesquelles aucune feuille ne remue aucun souffle d'air ne passe sur la nature engourdie se fait durement sentir pour les parturientes.

Epuisées par l'insommie qui resulte des conditions climatériques elles ne peuvent souvent accoucher qu'après de longues heures de travail, d'ou il resulte un danger assez fréquent d'inertie utérine et d'hemorrhagies de la delivrance.

Nous avons vu des accouchements se prolonger 2 ou 3 jours avec des arrets et des reprises de douleurs, et nous avons voulu expérimenter l'emploi de la pituitrine après avoir attendu avec patience jusqu'au dernier moment persuadés que dans beaucoup de cas le forceps peut etre évité, quand on a la patience d'attendre et quand la parturiente est surveillée constamment, ce qui est le cas dans la maternité de Lanessan ou la sage femme est présente jour et nuit, et ne s'absente que quelques heures par mois. Dans les cas cependant ou pour des raisons diverses dont celles mentionnees plus haut, la prolongation du travail devenait dangereuse pour la parturiente et l'enfant, nous avons essayé avec prudence l'emploi des piqures de post hypophyse.

La très intéressante étude de L. A. René de Cotret professeur a l'Université de Montréal dans le N°1 de la Revue de Gynecologie et d'obstétrique de 1926, et divers travaux publies un peu partout dans les journaux médicaux, nous enseignaient la prudence mais non l'abandon absolu du médicament a la mode, que certaines de nos accouchées réclamaient elles mêmes.

Nous avons voulu avoir une opinion personnelle et c'est pour apporter notre appoint et notre modeste contribution a l'étude de la question que nous présentons

Les observations montrent que la pituitrine injectée indistinctement à des primipares ou multipares aux différentes phases de l'accouchement, mais le plus souvent quand le transit de la filière pelvi-génitale était assez avancé au détroit moyen ou inférieur, plusieurs fois au détroit supérieur, n'a pas eu la plupart du temps un effet suffisamment durable et efficace pour amener l'expulsion de l'enfant ; son action s'est épuisée assez rapidement et il a fallu souvent terminer l'accouchement par un forceps ; mais toutefois l'hypophyse a facilité la descente ; nous n'avons pas eu d'accidents ni immédiats, ni tardifs ni chez la mère ni chez le fœtus ; donnée quand la tête est déjà descendue alors que la parturiente épuisée par son effort et par la chaleur dans les mois durs de l'été du delta Tonkinois, la pituitrine peut présenter des avantages. Mais nous avions pris soin d'examiner les urines et au moment de l'accouchement et à part le cas de l'observation VIII où on décelait quelques traces de l'ordre de 0,10 cg et où nous avions affaire à une paludéenne convalescente mais encore fatiguée, nos parturientes avaient des urines exemptes d'albumine et ne présentaient pas d'affections organique apparentes. Nous avons été beaucoup plus circonspects mais non abstentionnistes après avoir lu l'étude de Cottret professeur à l'Université de Montréal sur l'emploi de la trinitrine.

Nous avons généralement observé un réveil des douleurs qui se rapprochent, deviennent plus énergiques et amènent l'expulsion du fœtus assez rapidement. Nous n'avons jamais eu d'accident de déchirure du périnée ou du col, ni syncopes, ni vertige ou hémorrhagie cérébrale comme quelques praticiens en ont observées. Il faut pour administrer la pituitrine que la dilatation soit assez avancée que l'utérus ne soit pas dégénéré et que la parturiente n'ait pas d'affection organique du cœur ou des vaisseaux ou de néphrite albuminurique.

Observation IV —Madame B , entre le 2 Mai, 1926, IV pare, presentation O I G A le travail se luit le 3 Mai, la tête reste longtemps au detroit supérieur , on fait une injection de post hypophyse , h 50, la tete descend dans l'excavation et reste engagee en entre le detroit moyen et le detroit rieur , les bruits du cœur du fœtus s'affaiblissant , application du forceps et extraction d'un .nt du sexe feminin pesant 3 k 480, legere dechirure de la fourchette, 2 points de suture , la mère et fant ont quitte le service le 6 Juin en bonne sante, la duree du travail avait ete de 17 h 20

Observation V —Madame Z T , I pare, entre le 18 Juillet, 1926, entre en travail le 21 Juillet sentation sommet O I D A la tete resto au dessus du détroit superieur, les douleurs expulsives nenent aucun résultat , une piqure d'hypophyse est faite à 5 h 25, la tête avance jusqu'au detroit en et ne progresse plus On fait une application de forceps qui ramene un enfant de 4 k 150 du feminin , legere dechirure de la fourchette, 2 points de suture La mère et l'enfant ont quitte rvice bien portants le 4 Aout, 1926 La travail avait duré 41 heures

Observation VI —Madame C , I pare, entre a la maternité le 19 Aout, 1926, en travail, presenta- en O I G A les douleurs expulsives étant inefficaces, une injection de post hypophyse est faite h 50 , la tete etant en detroit moyen, les douleurs qui suivent l injection sont très energiques, nenent l'expulsion d un enfant du poids de 3 k 900 du sexe feminin à 11 h 40 La mere et l'enfant sortis du service bien portants

Observation VII —Madame O , I pare, entre au service le 11 Septembre Presentation O I D A. parturiente se plaint de souffrir dans les reins mais elle n'y a pas de douleurs expulsives efficaces. ction d'hypophyse, la tete s engage peu de temps apres et reste stationnaire au détroit moyen, lication de forceps, duree du travail 8 h 22, extraction d'un enfant du sexe feminin pesant 3 k 830, nere et l enfant ont quitte le service le 21 Septembre en bonne sante

Observation VIII —Madame B , realise le cas le plus eloquant de l'utilite de la prophy- ante partum et de la puericulture in utero , venant de Laokay, elle rentre dans le service de ecine en état de grossesse le 12 Juin, 1926, et atteinte de paludisme severe accès de 41,8, 40, istant plusieurs jours avec mort apparente du fœtus, bruits du cœur fœtal imperceptibles, et nce de mouvements actifs du fœtus, presence d'albumine dans l'urine 0 20 cg , plasmodium pracox le sang, reçoit un traitement intensif de quinine jusqu'à 3 grammes par jour en injection pendant ieurs jours, plus un traitement arsenical , Novarsenobenzol et cacodylate La temperature se et l'enfant se reveille et remue Reste en traitement jusqu'au 12 Septembre date à laquelle passe à la maternite Encore tres affaiblie, elle ne peut supporter l effort de son accouchement, et pas la force de pousser , les contractions utérines étant tres faible une injection d'hypophyse est à 15 h 40 au moment où la tete est au detroit moyen, les contractions se reveillent et l'enfant t normalement pesant 2 k 360 sans déchirure du perinée La mere et l'enfant sortent du service portants le 27 Septembre

Observation IX —Madame R , I pare le 1er Octobre, 1926 Presentation de la face, position te occipito sacree et mento pubienne La tete s engage difficilement jusqu'au milieu du detroit en et n en bouge plus Une injection de pituitrine est faite à 23 h 50 , de fortes douleurs expul- suivent cette piqures mais sans resultat appreciable , on fait alors une application de forceps, ro déchirure perineale, extraction d'un enfant pesant 4 k 150 Le travail avait dure 21 h 15, suite ouches normales, la mère et l enfant quittant le service en bonne sante le 17 Octobre

Observation X —Madame F , dame d'un Controleur de 2eme classe à la Compagnie des Chemins er du Nord à Hanoi (Tonkin)

Entree dans le service Maternite de Lanessan, Clinique des Dames Europeennes, le 20 Janvier, , à 20 h 50

Elle est accouchee normalement le Lundi 24 Janvier, 1927, à 22 h 15 d'un enfant bien portant exe feminin, en presentation céphalique O I D A pesant 3 kilos 540

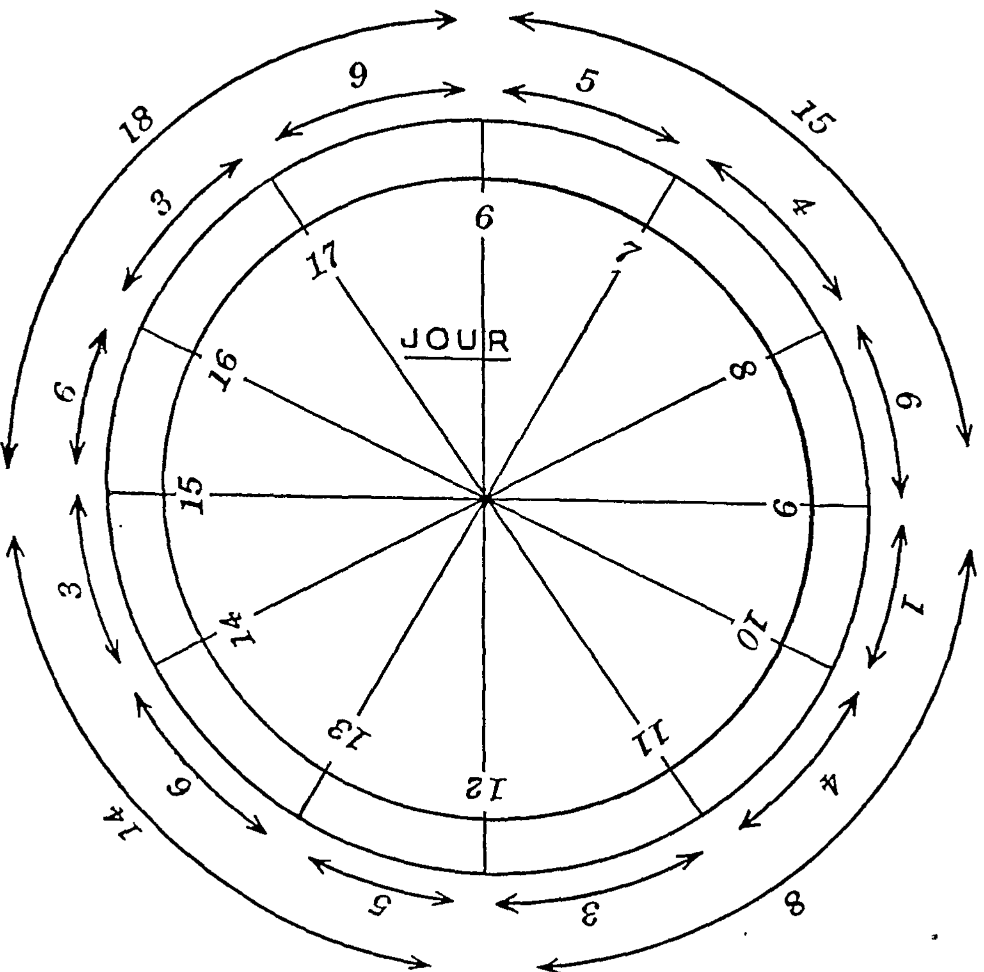
Apparition des premieres douleurs à 18 h ce meme jour, marche du travail tres reguliere jusqu'aux eurs expulsives , à ce moment les douleurs sont espacees, les contractions faibles, les membranes intactes, rupture artificielle des membranes amniotiques , douleurs tres faibles, on fait demi dose d hypophyse, quelques minutes apres violentes poussées expulsion d'un enfant nt

Delivrance normale et complete à 22h 20, poids du placenta 590 gr., pas de de hes très normales Poids du bebe à sa sortie du service le 2 Fevrier, 1927, 3

1923.

118 Accouchements.

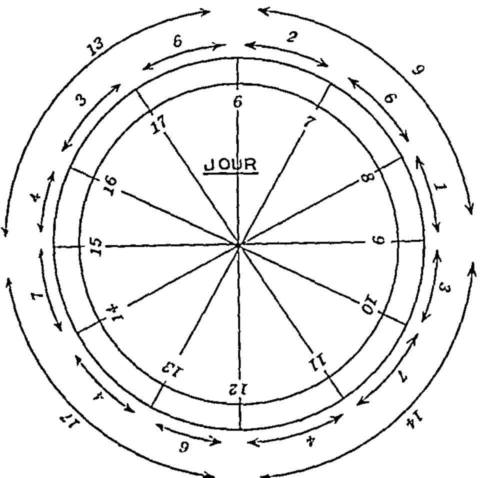
55 *du jour.* 63 *de la nuit.*

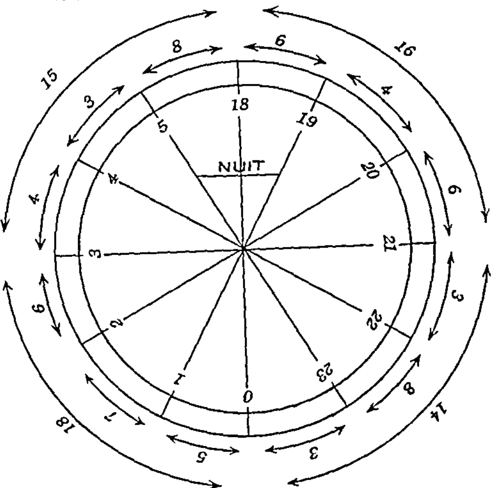


1924.

116 Accouchements.

53 *du jour.* 63 *de la nuit.*





1925.

130 Accouchements.

72 *du jour.* 58 *de la nuit.*

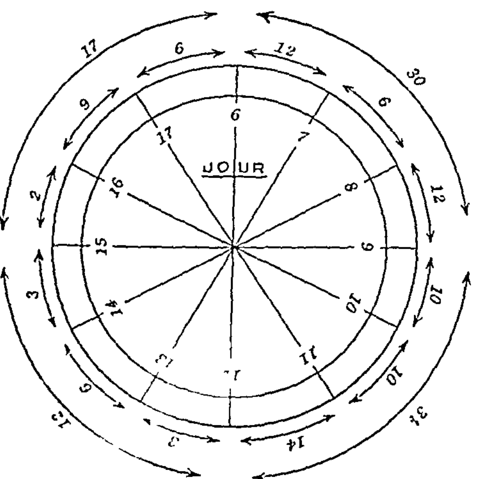
JOUR

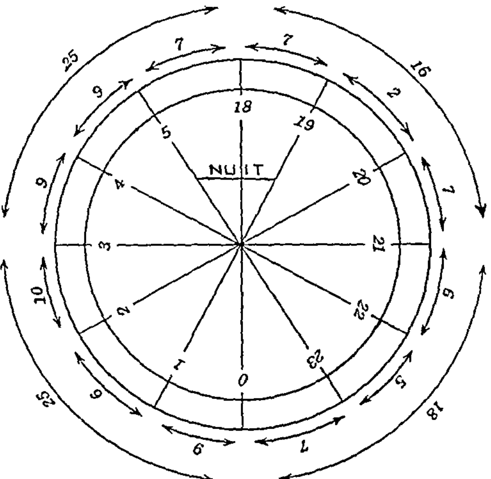
NUIT

1926.

177 Accouchements.

93 du jour. 81 de la nuit.





	1923		1924		1925		1926	
.	Nombre.	Proportion pour cent.	Nombre.	Proportion pour cent.	Nombre.	Proportion pour cent.	Nombre.	Proportion pour cent.
Nombre des accouchements dans l'armée.	118	. .	116	. .	130	. .	177	. .
Garçons . .	63	53,39	59	50,85	67	51,53	88	49,71
Filles . .	55	46,61	57	49,12	63	48,46	89	50,28
Nombre de forceps . .	9	7,62	1	0,86	4	3,07	12	6,78
Morts—nés . .	4	3,38	3	2,58	2	1,53	3	1,69
Nés—jumeaux . .	. .	. .	1	0,86	. .	. .	2	1,12

Positions.	1923		1924		1925		1926	
	Nombre.	Proportion pour cent.	Nombre.	Proportion pour cent.	Nombre.	Proportion pour cent.	Nombre.	Proportion pour cent.
O.I.G.A. . .	65	55,08	58	50,00	66	50,76	77	43,50
O.I.G.P. . .	11	9,32	8	6,89	9	6,92	16	9,03
O.I.D.A. . .	17	14,06	32	27,58	36	27,69	56	31,61
O.I.D.P. . .	23	19,49	14	12,06	11	8,46	16	9,03

Nés avant terme ..	1	0,84	5	4,30	4	3,07	5	2,82
Injections post hypophyses.		..			.		10	5,64
Accouch. des femmes militaires.	63	53,39	51	43,96	57	43,84	66	87,28
Journées de traitement.	2467	..	2013	..	2391			3377
Moyenne des journées	..	20,90	..	17,81		18,53	..	10,08
Moyenne générale des journées (tous les 4 ans)	19,08	..	..		..			
Poids moyen des garçons.	..	3k,261		3k,354		3k,178		3k,407
Poids moyen des filles.		3k,427	..	3k,313	..	3k,287	.	3k,271
Moyenne des poids annexes { garçons			..	0k,513	..	0k,536	..	0k,600
Moyenne des poids annexes { filles			..	0k,598	..	0k,588	..	0k,992

S I.G.A. ..			..		3	2,30	4	2,25
S.I.G.P ..			1	0,86	1	0,76	6	3,38
S I D A ..			2	1,72	3	2,30		.
S I D.P ..		.	1	0,86	1	0,76	2	1,12
O S .	2	1,69			.	..	..	..
Total ..	118		116		130		177	..

DISCUSSION.

Dr. J. N. Leitch (Assam): What experience has Dr. Jourdran had in the employment of pituitrin in the first stage of labour, especially in regard to the occurrence of contraction rings or rupture of the uterus.

(*Answer not recorded.*)

THE ORGANIZATION OF CHILD WELFARE WORK AND THE OBSTACLES IN ITS WAY

BY

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It is not necessary to spend much time in labouring the question as to what is the *raison d'etre* of child welfare work nor need we put forward any apologia for undertaking it

(1) The object of child welfare work is briefly, to prevent illness to set up the highest possible standard of positive health, and to use every means in our power to secure these ends The object of our care being the infant and later the child we are involved in the care of the mother before the child is born and we also have to bring our efforts to bear on all agencies which have any part to play in the rearing of the child It is to be noted that, in the first place, efforts were concentrated on reduction of infant mortality, as this was the most glaring and easily appreciated fact about babies available to the general public Mere reduction of infant mortality has, however, a somewhat negative appeal, and nowadays it is realized that all the positive factors which encourage health will *ipso facto* reduce infant mortality and that the net cast by infant welfare work is a much wider one than was originally supposed, and one that has *ramifications extending in many* directions, for example, into the realm of general hygiene, the study of propaganda work and its psychology, and educational work among future mothers, now girls in schools

Objections to child welfare work are still heard, though the opposition to it is, for the most part, simply inertia rather than positive action In the West, the fact of its success and the amount of health propaganda work which has gone on in recent years, has silenced the objectors and converted them to the light, but in India the ordinary member of a municipality often enough says 'What is the good of this work, we cannot see that it achieves anything' The rather more thoughtful person says 'India is over populated as it is, why save any more babies, better let them die so that those which do survive may have a less bitter struggle for existence' Neither of these points of view could survive if people understood what the real nature of child welfare work is, the first because they would understand what its real possibilities are, and the second because they would see that allowing babies to die, as they do at present, only means that those which survive are bound, through

the operation of the same causes, to grow up feeble and unhealthy citizens of little value to the community. Preventive ideas have gained ground in the West and are now being appreciated by ordinary people. This process has scarcely begun in India. Prevention is not applied, even by the educated, to obvious diseases such as plague, cholera, and smallpox, though its success has been amply demonstrated. We cannot, therefore, hope to see it carried out in the much more subtle way that child welfare work requires. Sometimes it would almost seem as if there were some special psychological reason why prevention, which is so logical a proceeding, should not appeal to the human mind. Up to now there are very few perfect child welfare schemes in India and many people have been 'put off' by the way in which the work has been undertaken. When one visits various welfare centres one sees the mistakes that have been and are being made, one cannot but acknowledge sadly that objections on this score are too often valid. In very many places we see the centre whose work should be preventive, turned into a dispensary, and a very inferior one at that, or into a place where charity is doled out. No attempt is made to follow the history of infants through regular visiting, ante-natal work is not organized nor is any teaching of mothers undertaken. The work is carried on by those who have been poorly trained, or sometimes not at all, and who have not sufficient education to carry it on on their own initiative. The committees responsible are not less ignorant and no amount of enthusiasm and good will can replace knowledge. What wonder is it that such undertakings fail entirely to achieve the objects for which they were started, and that they are regarded with indifference, if not with contempt, by the unsympathetic.

(2) Child welfare work, as up to now organized in India, consists for the most part of scattered bodies in various towns working independently of one another. There are a few organizations which are provincial in their scope but the financial help they can give is too small usually to allow of the central body having much control over the branch societies. Even where the work done is of doubtful value, there is seldom courage to close it down. These units are, therefore, more or less isolated and carry on their work as best they can, without much help from outside either in the way of advice or money. Visits from those who could give the former are few or non-existent. In the case of large towns, a good many have now child welfare schemes of their own. Sometimes these are supported entirely by municipal funds, but sometimes they are subvented by funds from the central Government or by contributions from organizations such as the Red Cross Society. Municipalities organizing their own work are independent of any inspecting authority such as the Director of Public Health of the province. In a few cases, in the Punjab mostly, the District Board is the authority responsible for the work. District Board revenues are under Government authority so that there is not the same freedom in spending them as in the case of independent municipalities.

Voluntary societies play a considerable part in child welfare work, though not so large as at first sight appears for the reason that they are often in receipt of financial

aid from municipalities or district boards. There are however many societies which are purely voluntary and which carry on their work entirely by charitable contributions. Some in Indian States and provinces other than Governors receive aid from the Lady Chelmsford League, and, in Governors' provinces often large amounts from the Red Cross Society. In some cases the continued existence of such societies is very precarious. They are started and kept up by one or two keen individuals whose personal efforts keep the ball rolling. When such individuals leave the place, enthusiasm dies down and the society ceases to flourish. This is especially true of small places which may be district head quarters where the number of educated people is very small. Hardly any have invested capital for an endowment fund but live a hand to mouth existence. It would be ungenerous not to acknowledge, however, how much is due to voluntary organizations both local and central. The lack of continuity of personnel from which they suffer is inherent in their constitution.

The combination of 'official agencies' and voluntary societies is really the commonest method of work in India though as remarked above this is not always apparent. On the whole this is the best method under the present circumstances in this country. A voluntary committee is more elastic in its methods than an official one, it is usually more enthusiastic and it has more of what for want of a better word we may term 'soul.' In such cases officials should always be represented on the committee. By their experience they can exert a steadying influence on the less experienced but more spirited non officials. They can also see that the moneys provided from public revenues are spent as wisely as possible and as they are 'ex officio' members, continuity is secured. An instance of this sort of committee is found in Lucknow where the money is derived from three sources, the local Government, the municipality and the Red Cross Society contributing one third each. The city medical officer of health is the secretary and the chairman of the municipality is president. In the United Provinces and Central Provinces the central Government hands over a certain sum to be expended by the provincial Red Cross or Chelmsford League branches on whose committees officials are freely represented.

(3) The relation of all these bodies to existing public health authorities is somewhat loose. Health officers, either municipal or district, are frequently secretaries of such committees and where such is the case they can, by virtue of their position, co ordinate the two activities. This is, however, not always the case, and, where it is not, there may be overlapping, and occasionally opposition and rivalry which are detrimental to the work as a whole. The Directors of Public Health are usually in sympathy with the work and may aid it actively, but they have no legal power to either advise or control. This is a serious weakness and its consideration leads us to—

(4) The need of an inspecting and supervising authority for each province, or at least for each larger province. In an address given at a Maternity and Child Welfare

Conference in London last July, the Minister of Health, the Rt. Hon'ble Neville Chamberlain, said :

'This Conference includes representatives not only of the great voluntary organizations which are taking part in this and in kindred work, but also of many Local Authorities who have their share in it and who are glad to find an opportunity of discussing with others who have had experience perhaps a little different from their own, the problems and the solutions which have come to them in the course of their work. I myself here represent the third member in the partnership between the voluntary workers, Local Authorities and the State. In my view every one of these partners makes an indispensable and invaluable contribution to the result. From the voluntary workers you get that enthusiasm, that intense active burning personal sympathy which is characteristic, above all, of people who are doing work which they have chosen for themselves because they love the work and not mainly because it is a means of providing them with bread and butter. From the Local Authority you get the helpfulness of a competent trained staff ; you get a continuity of policy which goes on in spite of the fact that individuals may change, and then, what cannot be despised, a sure and certain income. And from the State you get much needed financial assistance ; but you also get at the service of the locality that wider experience, that broader outlook which necessarily comes to those who have to make a survey of the country as a whole, and who are able to aggregate together the experience of a great number of different localities where conditions and experience are different.'

It is that 'third partner' which is so lacking, it seems to me, in India. There may be excellent financial and other reasons why it is so, but it is a great weakness and I feel that, until it is remedied, we cannot build our child welfare work on a firm and lasting foundation. Control and the right of inspection are essential to good work. We do not wish to see all work standardized in one groove, but there are, at least in each province, main lines to be followed and obvious mistakes to be avoided and this cannot be secured unless there is some guiding and controlling authority for the province as a whole. Many of us know well what disastrous results can ensue, how much money is wasted by municipalities or voluntary societies whose policy no one overlooks and whose work no one guides, whose staff have no one to advise and control them.

It must be clearly realized, however, that the control indicated cannot be achieved unless the central authority is prepared to spend money. It is only the giving of grants-in-aid that secures this to the Ministry of Health in England. Provision will have to be made in the budget of the Director of Public Health of the Province for the granting of such aid. The cost need not be vast at first as the number of bodies undertaking the work is small in most provinces as yet. The sums granted to individual places could be small at first and increase gradually as the local councils got used to the ideas and appreciated the schemes. The individual committee would quickly appreciate not merely the financial help, but also the expert advice and experienced help of the department. Up to now there

are at present only two provinces which have any approach to such a proceeding, and both have reaped the value. No voluntary society can do this work as its funds do not allow of the grants in aid necessary. I have assumed the work should be directly under the provincial Director of Public Health. This is the only logical proceeding. Child welfare work should also be regarded as a part of public health as a whole and only thus can proper co ordination be achieved. On no account should the work be under the Inspector General of Civil Hospitals as its preventive nature is then bound to be obscured. It is necessary for the Director of Public Health to have some officer working under him whose whole time will be given to the job. This officer should preferably be a medical woman and she must have special experience in it and an aptitude for organization. She should be a gazetted officer to give her proper status and she should have full rights of inspection.

The opportunities for good work that such appointments would afford are boundless. Progress would be more rapid, the work would be of better quality, the waste of money and energy that mistakes involve would be avoided.

The further obvious step of having a similar appointment in the Government of India awaits the day when 'provincial autonomy' will be less of a fetish and when it is realized that all have something to gain from co operation and centralization.

(5) Planning out of the work to be undertaken is often very badly done owing to lack of expert help. Committees must sit down to think out what they feel is most needed in their own town, how they are to set about achieving it, what staff is required, whether a building is necessary and what their permanent resources are likely to be. In all of these things the experienced worker can give invaluable help from the fruits of knowledge which hardly any member of an ordinary committee possesses. On the other hand, the committee members know the local conditions and ought to know the things which should first be attacked. Work must always be suited to local conditions and no one scheme is applicable to the whole of a province, much less to the whole of India. For this reason it is not necessary here to give a detailed account of the actual work to be undertaken in child welfare schemes. The starting point however I feel should be similar in all schemes and it is the registered births in the place. If birth lists can be secured this gives us at once something to go upon. Registration is known to be very defective in India and all child welfare workers should press for its improvement, but even as it is we can use it profitably. There is no other method of getting information about births and this information is essential to our work. Starting from this point, the systematic visiting of infants can begin, and if finance is a difficulty, the committee can be content with this activity at first. The development of centre work, ante natal work, and the following up of infants to the toddler stage can follow after, when funds and staff permit. Training of *dais* is another activity which may be begun early. The workers are bound to come across the *dais* early in their experience and they can make friends with them and induce them perhaps to come to classes

for instruction. If the municipality is progressive it may be able to enforce the attendance of *dais*, but in most cases in the past it has been found necessary to use some financial inducement to secure attendance. The experience of 25 years has led, however, to some doubts as to whether the considerable sums which have been spent in this way bring an adequate return. It is my opinion that it might be better now to spend some of this money in getting in more direct touch with our patients in the shape of ante-natal work. It may be that, could we offer inducements to the *dais*, they would bring their cases for examination or take us to their houses. In any case I feel that the development of ante-natal work should be one of the first planks on the child welfare programme from now onwards.

Accessary activities consist in such things as sewing or hygiene classes for mothers, supply of milk or foods, propaganda work and anything else which may assist progress. The help of voluntary workers renders all these more possible, but unfortunately voluntary workers are not a feature of child welfare work in India. Indian women are hindered from taking up the work by lack of education, lack of leisure and by social customs which place obstacles in their way. The wives of officials, both English and Indian, are constantly transferred or spend hot weathers in the hills so that their help can seldom be continuous. The class of moderately well-to-do women of leisure, and especially single women does not exist in India as in England. It is difficult to see how this defect is to be supplied, but it is a great pity that we have not such workers who are valuable not merely on account of the actual work they do, but on account of the spirit which prompts it.

Record keeping deserves more than a passing mention. It is a great advantage to have records properly kept from the beginning. This is a matter in which again the help of a central authority would be invaluable. At present records are often badly kept from ignorance of a proper system, or because the work is not being properly organized. If the work were more centralized, proper record keeping could be insisted on. This would be helpful to the local work, and it would also make it possible to collect much valuable information which is at present lost to us. The method to be recommended is of course the card index system, as is carried out in other countries. Small variations in the system can be made according to individual requirements, but the main headings will be the same. The Lady Chelmsford League has published sample cards which are gradually coming into use in various centres.

(6) We have pointed out that in India there scarcely exists the class of voluntary workers we are familiar with in England. This being the case, we have to employ paid workers even when the society is a voluntary one and supported by charitable contributions. When the work was first begun in this country those initiating it realized that if it was to be successful, a supply of trained workers was essential. Accordingly, a school for the training of such workers was started in Delhi in 1918 and similar schools have since sprung up elsewhere. These training schools have done excellent work, but the number of students they turn out is quite

inadequate in proportion to the number required The fault is not in the schools themselves, but in the lack of suitable candidates available Education of girls is so backward in India that few reach the high school stage and of these the majority take up medical or teaching work to which more 'izzat' is supposed to be attached Even from among those actually trained there is a big leakage through marriage, ill health and other causes The utmost difficulty is experienced in getting candidates of the right type of character apart from intellectual ability Yet that is essential in this work

Of recent years a greater number of committees have taken to the idea of employing medical women to be in charge of maternity and child welfare schemes This is an excellent move, but as used in India it has one or two drawbacks In the first place the idea underlying it in the minds of the committees is often one of so called economy They think it cheaper to have some one who can do both curative and preventive work The results to the work are as may be imagined disastrous In the second place, committees accept for purposes of this kind women doctors who have had absolutely no training in, or experience of the work and frequently those who have been engaged for years in ordinary practice This is equally fatal It is, therefore necessary to provide some sort of training for women doctors and up to now it has not been undertaken by any one What the training should be is not easy to say, but I suggest that a modification of the diploma of public health would be suitable A course could be formed which would include part of the instruction at present given in the course for the diploma of public health and to it could be added special work in child welfare in all its branches

(7) A complete paper could well have been contributed to the Congress on the obstacles existing in the path of the development of child welfare work They are, however, well known to all workers in India and have already been alluded to at various points in this paper I do not, therefore, propose to enlarge on them now Financial difficulties are the ones which are usually given most prominence, but it is a lack of willingness to spend money for the purpose rather than an actual shortage which exists If we want money, we must persuade people that they are going to get a return for it This simply means education of tax payers to understand, the advantages to the community of child welfare work It is a slow process in the nature of things, it cannot be hurried, but it must take effect ultimately and this educational work would, at the same time, sweep away the other existing difficulty inherent in social customs, illiteracy, and so on I am convinced that the rise of the general level of education in India will achieve more for the progress of child welfare work than any other single factor It will make people value health, be willing to spend money on it, and teach them above all, how to use what is already provided for their benefit

MATERNITY AND CHILD WELFARE IN THE UNITED PROVINCES.

BY

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I. The Problem of the Child.

The first question to consider is the 'Development of character in a pre-school child,' hence, to bring this about, parents should be educated to start with. For this purpose, centres should be established in all the principal towns where young women are trained in mothercraft and in the study of a normal healthy child. This is of as great an importance as the study of a sick unhealthy child, both from the physical and mental standpoints. They should be taught to understand how a child thrives on breast-feeding, how every effort is to be made to promote this mode of feeding and at regular hours; again, if breast-feeding is impossible or cannot be re-established, how to feed the child artificially in a simple way on a mixture nearer the percentage of breast milk, since most of the women are too illiterate to grasp the caloric requirements of the baby and have very little idea of the necessary vitamines essential for health and growth, and how to work out the diet according to age and weight of the child. They should be taught to watch the growth or development, weaning, habit training and hygiene of early infancy. They should also observe the teething period, the gradual introduction of solids into the diet, the teaching of a child how to drink from a cup and of studying and actually preparing a suitable diet. Hours of rest, feeding, etc., should be mapped out from the very day a child is born, so that the child learns regular habits from the beginning. Heredity has a great deal to do with the child and physical properties are inherited to a great extent. Abnormally there are two types of children we come across. One is the fat, flabby, watery, catarrhal child, mostly due to faulty dieting, especially over-feeding on a diet consisting mostly of starch and carbohydrates. The second type is the thin, nervous child, a boy born after 3 or 4 girls, consequently petted and spoiled, who gets easily tired, suffers from chronic dyspepsia and biliousness and liver troubles, cannot be expected to put in continuous work after he grows up, and requires to be firmly managed by those concerned. What he wants is proper regime and care with kindness and affection thrown in, proper hours for work and rest, light nourishing diet, regular exercise and army-like discipline and self-confidence. This would make a man of him and such a child, once taken in hand, when

he grows up would devote his life to his religion, community and country. From the 'egoistic' it is changed into the 'altruistic' and 'idealistic' form. Those who are interested in the welfare of their country have to study the character development of every individual child from its very infancy and to follow it through the home life, school life civil and military life. Here come the duties of parents, teachers and guardians. No man or woman has ever reached an age beyond management, as long as he or she has some self respect left. But great changes towards the formation or requirement of a character occur between the ages of 2 to 5 years. At this age the child begins to be rebellious self willed aggressive and destructive, especially if his mother does not understand what he wants. The formation of character depends primarily on the master's own character—the child naturally follows its ideal i e, the mother, father or a teacher and secondly it depends on the way in which his early impulses and desires are controlled by his parents. There are three ways (1) indulgence (2) repression and (3) development and redirection towards a healthy ideal by self control. The last is the best mode of dealing with a child. If his impulses are indulged he becomes sensuous and self willed and later even a criminal; if they are repressed or restrained or crushed he gets neurasthenic or a victim of psychoneurosis and later when he gets a chance he bursts out e g he either gets localized physical pain with no apparent cause—or he has a mental break down, but if he is controlled and redirected towards a healthy object he becomes a man of strong character i e with strong impulses well controlled. In a child's dependent phase if love and protection are denied to him, it leads to depression and melancholy in later life. If the impulses are totally crushed he becomes hysterical or neurasthenic or he has no will or character. Thus we come across some who are sensuous some self willed some victims of their own moods and passions and some victims of other people's will while some are such as when left to themselves 'pick up' all wrong mistaken ideals and go to the extreme and use whatever brains they may have in a wrong sense join others who have similar brains form a sect and in their hearts believe they are doing good to their community or country, though actually they are doing more harm than good. Their brains judgment and will are not properly balanced or developed, so that right from wrong cannot be distinguished. They have no power to foresee or realize the results of their doings and they are altogether creatures of their own impulses. We occasionally come across parents and professors or teachers who are puzzled over the character and conduct of their grown up children. They are reaping the fruit of their own early training of them. They lament their own fate or luck when their grown up children do something rash some thing they do not approve of. They little realize that it is the reaction which has set in. It is, therefore, the duty of all parents to learn how to develop their own children's character. If a child is rebellious the rebel is not to be cured by breaking his will; to do so would be a great mistake. One should find out what made him rebel; it may be misunderstanding and want of affection on the part of parents and guardians. If a child is aggressive and self conceited, it is perhaps because he was allowed to

be humiliated, when he wanted to show off that he was independent. Therefore one must not forget to give full sympathy, care, protection and affection to an ultra-independent child. They are his by birthright. Lastly in case of a conceited child, it must not be forgotten that he needs every encouragement and confidence. Generally he should be allowed to do a thing he desires to do and should not be thwarted from doing it for the reason that it is beyond his capacity and may apparently do him harm, e.g., if he wants to cut an apple he should be taught how to do it, even if he is too young ; or if he wants to climb a tree, he should be taught how to do it. The very fact that he wants to do a thing shows he has reached a stage when he is capable of doing it. A great opportunity is lost and much harm is caused in the future if his curiosity is not satisfied. The strong will of the parents or guardians is later to become his will ; therefore vacillation on the part of those responsible for him will produce in him a lack of self-control. Those who are true patriots should realize that their duty lies not only in bringing up children healthy in body, but in mind also, it is very important to train the mind towards the development of strong character and usefulness in life, since no service is greater than to turn out the future citizens of the land fit for the country, both physically and mentally.

II. Maternity and Child Welfare in the United Provinces.

Since the Director of Public Health, United Provinces, I understand, has dealt with this subject in detail in his report, I give below only a brief account of the inauguration of, and the work done by, the Provincial League for Maternity and Child Welfare under the Inspector-General of Civil Hospitals, United Provinces.

The question of establishing a provincial branch of the All-India Lady Chelmsford League for Maternity and Child Welfare, came into prominence during the year 1919-20. Training centres in the provinces were started with a view to providing trained *dais*. In 1922, the branch was finally established on a sound footing, and His Excellency the Governor of the United Provinces accepted the presidentship. A managing committee was formed which is now known as the Council of the League. The aims and objects of the league are :—

1. The training of midwives and of health visitors and maternity supervisors and the rendering of financial assistance in the employment of a trained staff where necessary.

2. Propaganda work intended to draw the attention of the public to preventable illnesses, the suffering and death of mothers, the large number of still-births, the large mortality among infants after birth and the seeds of illness sown in the newly born. We have no statistics of the unnecessary suffering, ill-health, chronic or acute, of married people but we do know that the death rate among newly-born infants is at least four times that in England—that 270 or more infants per thousand die before reaching one year of age. To meet these evils, which reflect on our civilization and are most disastrous to our country, it is necessary that the mother should be advised during the pre-natal period. She should be skilfully treated

at the time of delivery and for two or three weeks subsequently, and that the best should be done for the child during the critical early months of its life Good hygiene of the home throughout the whole of the above period is of equal importance

3 The third aim is the formation and establishment of sub branches of the league and affiliation with branches of other associations having similar objects without unduly interfering with the organization and administration of affiliated institutions or with their powers of raising money

4 The fourth aim is the carrying out of such measures as are incidental or conducive to the attainment of the above or kindred objects such as improvement and training of indigenous and superior class of *dais* etc These midwives when trained act as instructors and helpers to *dais* ' and attend to maternity cases without receiving any remuneration Frequent visits to houses are paid by them and *by the health workers and medical women wherever employed* Part of the work also includes propaganda by means of magic lantern demonstrations for the benefit of the masses, and by such exhibitions as baby shows health week etc from time to time at various places Our attention is at the same time directed towards educational work We want the medical profession specially private practitioners to take an interest in this noble task which we have taken upon our shoulders for the well being of our country There are already signs of reduction not only in the mortality of infants, but also in that of mothers wherever efficient work has been carried on in the centres

Since 1922 centres for the improvement of indigenous *dais* have been opened in 22 districts Centres for training of superior class of midwives have been opened in most of the important towns where there are large hospitals for women and where a sufficient number of confinement cases are available and also where child welfare work is fully established Our chief drawback is that we cannot get a better and more respectable class of Indian women *for training* as nurses

In the past hospitals were the only institutions of the kind but very few women could be persuaded to seek advice or medical aid there and that too only when domestic remedies and indigenous medicines administered by unqualified men and women gave no relief The popular tendency is to seek advice in diseases resulting from badly managed confinements whereas aid has very rarely been asked for before or at child birth Out of 1 000 births about 20 take place in hospitals, the rest at home Most of these even are rarely seen before confinement or after they have left the hospital and therefore their further progress cannot be watched This unsatisfactory state of affairs and the high rate of infant mortality led to the opening of child welfare centres With the progress of civilization the value placed upon life has increased, and the high average death rate of 270 per 1,000 births of infants, under one year of age has come to be regarded as a blot on the nation and has demanded efforts to bring about its reduction A reduction in the number of births would also appear to be a natural accompaniment of advancing culture

The problems of infant mortality were carefully gone into and one of the chief causes was found to be the employment of untrained, ignorant, and dirty *dais* or midwives during confinement, since 50 per cent of deaths among infants were attributed to tetanus caused by their crude and dirty methods. Hence the improvement in their methods of confinement was first taken up by the employment of qualified midwives to supervise their work in the patients' own houses. To further encourage them, remuneration was given to attend lectures at the hospitals and to call the qualified *dais* to their cases.

The training of a better class of girls as midwives was the next step in progress. Health schools have been opened in principal towns for the training of midwives as health visitors. Maternity and child welfare centres are being opened in more places, not only to advise mothers, but also for the care of children and the treatment of the various ailments. Propaganda work directed to educating mothers, to teaching them how to look after their children's health is being carried on, stress being laid on preventive rather than on curative measures. Every possible thought and care is given to every mother not only during the expectant period, but during confinement also and the further progress of the mother and the child is watched until the child is one year of age. It is the duty of midwives, health workers and voluntary workers to point out the advantages of cleanliness, fresh air, sunshine, and ventilation, of regular and proper feeding, of suitable clothing and of vaccination—also the disadvantages of early marriage, of bad ventilation, of blind adherence to old customs, of dark dirty rooms and houses, of seeking medical advice too late and of employing untrained *dais*. One can see that the above factors of ill-health and deaths are due to 'poverty' and 'ignorance,' hence the mind of the workers should be directed to overcome poverty by raising funds and arousing interest and sympathy among the local bodies responsible for the welfare of the public—and advancing education to promote health. The necessity of preventive work is not realized by the elderly woman who pretends to know all that is taught her and finds little attraction in the maternity and child welfare centre. Hence, to do substantial good to the people, it is necessary that voluntary agencies should come forward to educate public opinion in this respect. It is needless to mention that hospitals are meant for the cure of diseases, while child and maternity centres are meant for preventive work. When it is realized that prevention is not only better but also cheaper than cure, the father of the child will have less worry and more time to devote to his work and the mother will not be constantly at the bed-side of the sick child, but will have time to pay more attention to her household duties. When men are better cultured and women are more advanced in education, husbands will find suitable mates and companions in their wives, and brothers will be happy to find in their sisters suitable colleagues and friends to discuss various problems concerning their college and social lives. There will be no more riots and strifes for petty causes. The principles of religion will be understood and followed more thoroughly. Every one will be more interested in the welfare of his or her children from the health point of view, and in the welfare of the country so as to put her

on the same footing as more advanced countries Parents will be proud of healthier children, and citizens of their own health and that of their fellows There will be few sad hearts for having lost the only baby, soon after birth, or a sweet prattling toddler, 2 years old, or a young grown up son on the eve of a most promising career, or a young wife who dies leaving one or two children, or a husband who dies leaving a young widow to mourn his loss A day will come when our friends and neighbours and acquaintances will not think of hoarding wealth for themselves and their own children and near relatives, but will reason among themselves and learn how to live for others Each day every individual will come to think and argue Am I living and earning for myself or for my wife and child? What am I doing for my brother or for my neighbour? I am not sent to this world for myself only *Ego* is no longer my motto as it used to be that of my father and grandfather or my elder brother' We have tried to arouse the interest and sympathy of the present elderly and grown up men and women, we may have failed but let us from this moment take in hand the education of their children so that if we have failed with the fathers, perhaps the sons and daughters will make up the loss and help us or our successors with funds to enable the workers to carry out the modern schemes of improvement of the health of the nation Let us hope that if fathers have not responded, or if sons are not responding we shall yet overcome their apathy and indifference and have better chances with their children Days such as we see now will be seen no more

Disraeli has said —

'Public Health is the foundation upon which rests the happiness of the people and the power of the state Take the most beautiful kingdom give it intelligent and laborious citizens, prosperous manufactures productive agriculture let arts flourish, let architects cover the land with temples and palaces in order to defend all these riches, have first rate weapons fleets of torpedo boats if the population remains stationary or if it decreases yearly in vigour and stature the nation must perish And that is why I consider the *first duty of a statesman is the care of Public Health*'

SOME SUGGESTIONS FOR THE FURTHER DEVELOPMENT OF CHILD WELFARE WORK IN BENGAL.

BY

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1. The efforts now being made are sporadic and undertaken largely by voluntary associations with no 'official' recognition from Government. There is a great lack of uniformity and co-operation.

Great need therefore exists for :—

(1) The appointment of a specially trained officer by each Provincial Government to direct the work in the Provinces under the Director of Public Health.

(2) To obtain the best results by standardization and uniformity, it is necessary to have in each Province a 'health school' provided by the Provincial Government for the training of health visitors with a uniform standard of training.

(3) In each Province one 'model' child welfare centre should be founded if possible in close touch with a well-equipped maternity hospital and a 'mothercraft' school where women can be admitted for a few days if necessary.

2. Causes of 'infant mortality.'

Very little is known as to actual 'causes' in India. A great deal of material can be supplied and utilized in a properly equipped welfare centre with a specially trained staff to carry out ante- and post-natal research work.

3. Criticisms of existing child welfare centres.

(1) There is a great tendency to convert 'clinics' into small dispensaries and in some centres, in the mill areas, health visitors are employed to do the work of doctors.

(2) Too little educational work is done.

(3) Ante-natal work is not sufficiently emphasized.

(4) Tendency to 'give' and 'do' everything and not make the people 'do' themselves.

(5) The medical profession should themselves disassociate the work of 'cure' with 'prevention.'

'Prevention' must be the key-work at the Centres.

Summary.

There is a great need for the Provincial Governments to interest themselves in welfare work by the provision of :—

(1) Specially trained officers.
(2) The establishment of health schools.
(3) Model infant welfare centres and a 'mothercraft training school,' with a specially trained staff for the investigation into the causes of infantile mortality in India.

ORGANIZATION OF CHILD WELFARE WORK.

BY

H. V. TILAK, M.B., B.S. (Lond.), F.R.C.S., (Edin.), B.SC.,
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THE mother is or should be the central figure in all child welfare work and, therefore, we must first give due attention to her health during her pregnancy and advise her properly as regards the arrangements for her delivery. More attention should, therefore, be paid to a antenatal work and to the education of the mother in mothercraft. It has been found that about 50 per cent of the deaths of babies occurring in the first fortnight after delivery are preventable by efficient antenatal, natal and neonatal supervision and care of the mother. The question of dietetics also has so far received scant attention though it is of very great importance. Mothers must know which foods are cheap and yet nutritious and full of accessory factors and how to prepare them.

A systematic organization of child welfare work on approved lines is necessary in order to prevent overlapping and wastage of money and energy. The workers must be imbued with the preventive and educative nature of the work, otherwise child welfare centres degenerate into merely dispensaries for children and depôts for the supply of milk.

This forces on our attention the need of an officer, male or female, in every province, in order to give expert advice to, and supervise the work of, the various child welfare organizations in the province.

The celebration of health and baby weeks in several towns and villages during the last few years has attracted the considerable attention of all sections of the public to the health conditions of mothers and children and is gradually dispelling the notion that poverty is mainly responsible for the abnormally high disease and death rate among them. How a high infantile death rate is possible even among the well-to-do is seen by looking at the figures given by the Bhatia Maternity Hospital of Bombay which admits mothers of the Bhatia community only.

These figures clearly show the amount of good work such a scheme can do to a community by diminishing considerably the terrible waste of infant lives and by improving the health of mothers and babies.

TABLE

Vital Statistics of the Bhatia Infants in Bombay for the Years 1925 and 1926

Item	Of those attended through the scheme		Of the rest of Bhatia infants as stated in the health reports (1925 and 1926) of the Bombay municipality	
	1925	1926	1925	1926
Number of births	50	66	85	77
Deaths under one month	1	5	12	10
Deaths under six months	6	4	18	12
Deaths from six to twelve months	1	1	15	16
Total Infant deaths	8	10	45	38
Rate of Infant mortality per 1,000 births	**160**	**151**	**530**	**493**
Still births	4	4	7	Not known

It is being increasingly realized that (1) ignorance of the parents in the hygienic care of mother and child, (2) the prevalence of harmful customs, and (3) the absence of welfare measures, such as child welfare centres and maternity homes, are in a large degree responsible for the abnormally high disease and death rate in mothers and children.

The baby and health week propaganda has led to a demand for more midwives and lady health visitors *Two practical difficulties* have been encountered at this stage, viz, *funds* and *trained workers* Funds will be forthcoming when the public realize the importance of starting child welfare schemes, even from the economic point of view Less diseases and deaths mean saving of so much money in the care and cure of the sick Better earning power again means increase in wealth Educative propaganda, therefore, as carried on by the holding of baby and health weeks, is essential and should be continued and expanded.

The establishment of small *maternity homes* with some paying beds will be found in many places a practical proposition and useful in popularizing child welfare.

In all municipal towns with a population of 5,000 or more it costs from Rs. 20 to Rs 30 for every delivery case and its nursing for ten days, even when the same is done by an untrained 'dai' in the house of the mother It is not, therefore difficult to induce mothers to go to a maternity home for delivery and pay the home from Rs 20 to Rs 25 for ten days' stay. Three classes of paying beds may be maintained so as to suit all pockets and free beds may be kept for the poor.

The outdoor department will serve well, at a small extra cost, both as an antenatal clinic and a child welfare centre to be worked on alternate days. An experienced midwife paying occasional visits to mothers in their houses will popularize both the maternity home and the child welfare centre.

As the majority of labour cases are normal, it is not essential to have a resident lady doctor if funds are scanty. A private male doctor can visit the home every day for general inspection and at other times, when called, for treating abnormal labour cases on a small honorarium. The maternity home will also be useful for many villages in the neighbourhood of the town in cases of abnormal labour as the same can be sent to this home.

A visiting midwife can attend at the most ten delivery cases in a month, but in a maternity home two midwives can attend even 40 deliveries or more in the same period. Again, in the mother's house, daily attendance of the midwife can only be of the nature of a visit, while in the maternity home there is usually a constant attendance. Moreover, probationers can be trained as midwives and professional 'dais,' or preferably their daughters, can be engaged as 'ayahs' and instructed in the observance of cleanliness and non-interference after which they can practise in the distant villages where trained midwives are not available.

It is necessary for the success of these homes that they should not be a part of, or near, a general hospital where accident and serious cases, male and female, are received. The home should be in the heart of the town and not outside it as many of the municipal dispensaries and hospitals are. It should be under the management of a voluntary body with a Government or municipal subsidy and supervision. This arrangement will tend to make both the home and the welfare centre more economical and popular. The preliminary expenses should be met by the local bodies and, if a suitable building is not available free of charge, the same may be rented rather than spending money over a new building to start with.

Maternity homes started and conducted on these lines will be to a large extent self-supporting and thus offer a solution for the scarcity of funds. The actual working of such homes will prove a potent factor in dispelling wrong notions about maternity and in giving practical instruction in mothercraft to the mother.

The question of finding a sufficient number of trained workers is also causing great anxiety, but if probationers are trained in all these homes—and such training can be given at a little extra cost—the number of midwives can be rapidly increased. The shyness and ignorance of the girls prevent them from going to large towns for training, but they can be induced to go to such small maternity homes nearer their villages.

It is still more difficult to get suitable candidates to be trained as midwives. Most of those that apply have not sufficient preliminary training even in their mother tongue. There is a large class of such girls—mostly young widows—available for this work, but unless some arrangement is made for their preliminary training *free of charge* not much progress can be made. The Poona Seva Sadan

Society has succeeded in tapping this source and turning out a large number of trained midwives and nurses The Society admit such girls and gives them preliminary training so as to fit them for a midwife's or nurse's course If they are poor, all the expenses are borne by the Society on a written understanding that they are to repay their debt when they are employed as trained workers

DISCUSSION

Rai Bahadur Dr Chuni Lal Bose (Bengal) I rise not to offer any criticism on the four excellent and informing papers on child and maternity welfare work, for there is very little room for criticism, but to record our deep appreciation of the value of the papers and the valuable suggestions thrown out to combat the difficulties All the four lecturers have hit upon the right point as to the primary causes of the great infant and maternal mortality that prevails in the country viz ignorance and superstition The rate of illiteracy in India is 92 in 100 among men and 98 among women Because of this appalling ignorance, it is very difficult to get the proper kind of women to learn the work of skilled midwives and for others to be trained in maternity and child welfare work This difficulty should be removed as best we can The difficulties which confront us in this work are very great, but we need not feel despondent Some progress has been made since my student days in the reduction of mortality of both mothers and infants Fifty years ago the rate of infant mortality in Calcutta was about 600 per 1 000 whereas it has gone down to about 300 per mille This has been accomplished by greater attention to the general sanitation of the town improved and skilled attendance to mothers and infants before and after delivery The Calcutta Corporation has done a great deal of good work in this direction by establishing maternity hospitals, and by employing lady doctors as lady health visitors with a [illegible] number of qualified midwives to attend all mothers in the houses of the poor [illegible] after mothers and children before and after birth

Dr Jose Fabella (Philippine Islands) It is [illegible] from overseas to hear from the various speakers [illegible] maternity and child welfare in India similar to those we have in [illegible] With reference to the points well brought out by the [illegible] have worked them out in our country [illegible] centres as we call them there) start [illegible] members of a given community when their [illegible] the centre physician nurse or midwife [illegible] and as often as possible to the centre [illegible] of the centre, which is preventive [illegible] giving special hours for mothers to come [illegible] With regard to getting and training [illegible] make it a practice to train all nurses [illegible] practices adopted in conducting [illegible] also train midwives by conducting [illegible] regions of the Philippines—the [illegible] services of competent graduate [illegible] unlicensed midwives to come [illegible]

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Dr Jose Fabella (Philippine Islands) It is certainly a pleasure for us that come from overseas to hear from the various speakers this morning about problems affecting maternity and child welfare in India similar to those we have in the Philippines. With reference to the points well brought out by the Lady Chairman, I wish to show how we have worked them out in our country. Most of the child welfare centres (puericulture centres as we call them there) start and receive the interest of the mother and other members of a given community when their baby is sick. But, with this start, through the centre physician, nurse or midwife they are made to come back regularly and as often as possible to the centre and gradually bring about the primordial object of the centre, which is preventive and educational. Prenatal work is carried on by giving special hours for mothers to come when a lady doctor is on duty at the centre. With regard to getting and training workers for maternity and child welfare work, we make it a practice to train all nurses for two weeks or a month on the methods and practices adopted in conducting puericulture centres before they can be employed. We also train midwives by conducting schools of midwives in the three most important regions of the Philippines—the idea being to supply small communities with the services of competent graduate midwives. We requested the old ignorant and unlicensed midwives to come and attend the practical instruction given at the centre

and, if they were found to have acquired proficiency in the practical instruction given, they are given a certificate. If they are found to be neglectful, their certificate is withdrawn. More details about our methods which I have mentioned, can be found in our publications which I will be glad to furnish if any one lets me know.

Dr. J. Munsiff (Bombay): As one connected with the public health activities of the Bombay Presidency, I am brought a great deal in contact with all movements connected with maternity and infant welfare. Wherever I go I hear a great deal about the unhygienic conditions responsible for high infant mortality and mortality among young mothers and the measures taken to combat such evil influences are all laudable. But I have never heard any one yet refer to the social customs prevailing in different communities which are responsible for the high maternal and infant mortality. Speaking as an Indian for Indians to an audience composed largely of Indians, I hope I shall not be misunderstood when I say that there are many social customs responsible, and unless the social reformer joins hands with the hygienist and the two make a whole-hearted effort, it will be impossible to eradicate the evils we are contending with. Indians should give up 'over-sentimentalism' and the art of 'self-deception' which make them hug injurious customs merely because they have the sanction of time and usage and should help the hygienist in striking at the root of the evil.

Lieut.-Col. A. J. H. Russell, I.M.S. (Madras): In agreeing with Dr. Munsiff's remarks, I should like to congratulate Dr. Young on the pessimistic tone of her paper, because I believe that until we recognize that schemes in India are at present not what they ought to be, we will not make the necessary progress. The reason for the poor work of child welfare centres in India is because we have few trained workers so far and health visitors do doctor's work and midwives do health visitor's work, so that little progress is possible. We in Madras recognize the fact that our child welfare centres are not run properly, and so we have placed before Government a scheme for the opening of two model centres attached to our maternity hospitals which will provide a school for the training of health visitors where the candidates will, after the training, get a Government diploma. When this school is opened, we hope to get all the suitable candidates we need.

I do not believe the solution of the question lies in the training of 'dais,' who, in my opinion, will revert to their old habits and customs whenever they are sent back to their districts and villages.

Dr. S. L. Sarkar (Bengal): Pointed out that the real difficulty in child welfare was not the ignorance of the masses, but of the medical men. We often do not know the real causes of infant mortality in many places. For example, when I was civil surgeon in the Khulna district, there was the highest infant mortality in the thana Assasuni. On going to investigate the reason for this, I found that the real reason, as was pointed out by the people of the locality, lay in the fact that a particular variety of bad grass, growing in marshy land, was being used as cattle fodder. This grass gives bad quality to the milk, and this in turn gives rise to infantile liver, which was the cause of the marked high mortality amongst infants. Subsequently, I investigated the problem of infant mortality in the different villages of the Khulna district and I found that in villages where there was 'durba' grass the curve of infantile mortality was low from year to year, while in villages where there was grass of bad quality, the curve of

infantile mortality was high I published an article on the subject a few years ago in the *Indian Medical Ga ette*

In my opinion we should not ask for money for the Red Cross Society or any particular society, but for a particular body of scientific men who could be deputed to study the question particularly From the papers in this section the question does not appear to have been studied scientifically by facts and figures as in other sections, but everything has been attributed to ignorance and superstition This sort of assumption is not consistent with the spirit of scientific enquiry What we should try to do, is to go to the villages and try to determine the causes for every different infant mortality, and by statistical figures we should try to mark out the causes and find the real remedies If in this way we get true knowledge it will naturally spread amongst the masses In my opinion child welfare meetings as conducted at present, do not appear to be doing much good They do not appear to be impressing the middle classes in the villages and in the towns which are really the conduit pipes for conveying knowledge to the people This middle class would be profoundly impressed if a real enquiry like the above were started which would help to spread knowledge more effectively and at less expense, than is being done at present

Dr (Mrs) F V Rushforth (Bengal) In New Zealand the death of an infant under two years of age from preventable disease is a civic calamity It is a far cry from New Zealand to Calcutta but until this attitude towards the child as a potential citizen is more general, there can be only slow progress in infant welfare work I make a plea for the establishment of mothercraft centres (the means by which Sir F Truby King in New Zealand has achieved such magnificent results) throughout India not only for the poor cooly children, but for every community and for every class By this means every child born becomes of importance to others besides its parents and those working in the centres share the responsibilities of the mother To start these centres the appointment of women assistants to the Director of Public Health is absolutely necessary At present it is no one s business to start centres Calcutta has five when it should have 25 or more These five have been running for about six years and were started in the great hope that within a short time each would be multiplied many times I would like to support Dr Headwards in her appeal to Government to come now to the aid of the welfare work in Bengal The Chairman has asked for advice as to development of methods in centres This is contingent on the place and community for which the work is being done In some places the people are so poor and the milk supply so bad that it is necessary to run a milk kitchen In other communities it would be an insult to the mothers and children to offer them milk though their need for education and help is none the less In Chhindwara an ideal health centre has been opened in connection with a children s hospital and maternity home In other places suitable dispensaries and hospitals are at hand In a land as large as India we must lay down no hard and fast rules for a developing service, but education, as the chief aim of the work and the recognition of the potential value of each child as an incentive may be kept before the medical profession and the public

Dr S K Gupta (Bengal) Said that in considering the problem of child welfare it was admitted everywhere that 'prevention' was the great motto, but in Bengal they had to meet many customs and traditions The organization should, therefore, be

modified by them. Ignorance is the cause of certain customs. To do away with this ignorance, each centre (District Board or any such committee) should appoint certain health visitors, who would visit each individual house, like the lady vaccinators, and tactfully preach the principles based on the *laws of Nature.* 'Errors of Diet' were the chief cause. To preach the principles of proper diet, they required persons well trained in that respect and not merely trained midwives. Open air lectures might be good for the educated townspeople, but purdah ladies could not come to listen to these lectures. He would, therefore, suggest that this proverb be remembered that 'Charity begins at Home.'

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In a portion of our city there are certain communities the ladies of which will not allow themselves to be examined even by lady doctors, although much persuasion is used. Is it not advisable, therefore, to have the whole scheme managed by a lady superintendent independent of the male interference? The very meeting here, with a lady president and other ladies to assist, shows how the wind blows. I hope our Director of Public Health will take note of it and recommend, not a lady assistant health officer, but a lady superintendent independent of the health officer.

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through which the propaganda work may with advantage be made. There should also be co-operation with the mothers because no organization can succeed without the co-operation of the parties chiefly concerned in addition to the organized efforts of the rulers and the ruled. What is needed is an extensive and intensive propaganda work through the Central Body as outlined above. Another question is the financial difficulty. So far Government help has been quite insignificant as far as funds are concerned. The organization should be a provincial affair and provincial revenue together with public munificence should overcome the financial crisis.

Major V. M. Phatak, I.M.S. (Gwalior, B. India) : There are various and different branches of work all correlated with each other along which maternity and child welfare work should, in my opinion, be developed. The unit for such work should consist of the following :—

(1) *Maternity Home.*—A convenient size is a home with six beds. This should be able to provide for about 150 to 200 deliveries a year and should be enough for the demands of a population of 15 to 20 thousand. This excludes cases attended by 'dais' in private houses. It should be remembered that only normal cases should be admitted here and every abnormal case should be sent to the hospital. Such an institution should be a home, i.e., persons coming to it should feel as if they are in their own houses and quite at ease. There should be complete privacy from the outside public, although their own relations should have a free access. Such homes should not have the glamour or the rigid discipline of an hospital. Trained and certified 'dais' should be allowed to bring in their own cases and conduct them themselves in such homes. The home should be in charge of a fully qualified and tactful midwife trained as a health visitor and capable of teaching and training 'dais.' In Gwalior, with a population of about a lakh, we have four such maternity homes which conduct about 400 to 500 cases a year and in which up till now within the last three years over 200 'dais' have been trained.

(2) *Dais' Training.*—Under present conditions in India, except probably in Presidency towns, qualified medical assistance is not within easy reach of the majority of the population, much less a duly qualified midwife. We must face facts and remember 'dais' will always be in demand by the people and so the best way to help the people is to train these 'dais' in the modern methods of conducting labour. In the absence of a sufficient supply of qualified midwives, the class of 'dais' cannot be ended. It is essential therefore that they should be mended and if necessary weeded. That most of the 'dais' can be trained and made useful is my firm conviction from my experience at Gwalior. Work along similar lines is being successfully done under Major Webb, I.M.S., at Simla. We train indigenous 'dais' in Gwalior without any interference with their occupation whatsoever. They are trained for three to six months and when at the end they pass their test, they are given certificates with equipment. They are also supplied with books in which their work is recorded after inspection by the health visitor. Rewards are given to good workers at the end of the year. This is very much appreciated and helps to weed out the bad 'dais.' That the scheme is popular amongst the 'dais' is shown by the fact that they are already moving to be registered as licensed 'dais' and to stop the few who are not yet trained but still practising. They are also of great help in the proper registration of births. Whatever training the present 'dais' get will also be of help in clearing the way for the training of future

dais,' who will probably be the relations of the present ones Dr Scott, our president, has seen some of our work at Gwalior and will be able to testify to its utility It must be remembered that even these trained 'dais' are likely to relapse into their old ways unless constant supervision of their work is maintained Our experience has been that with the opening of these maternity homes and the training of 'dais' our hospital admissions have rather increased than decreased, as all the abnormal cases are promptly sent to the hospital

(3) *Antenatal and postnatal work* by a competent health visitor who is also responsible for the supervision of the work of the 'dais' in the patients' houses

(4) *Childrens' Clinic and Milk* —Milk distribution centres will be of more benefit if treatment of simple diseases can also be given at the centres The object of a milk centre should be to make good and reliable milk available free to the poor and deserving and at reduced or full rates to others To ensure this, it is desirable to organize a dairy in connection with these centres, or to subsidize milkmen whose supply can be inspected.

(5) *A sewing class for 'dais' and future mothers* could be usefully attached with this work

(6) *Infant Orphanage* —An infant orphanage in connection with such maternity homes is a necessity This will provide for the infants of unmarried mothers, an important problem common to all concerned and to which fact it is no good shutting our eyes It will also provide for motherless infants of poor or even well to do fathers and real orphans We maintain one such orphanage at Gwalior as a part of our scheme

(7) Fortnightly or weekly *magic lantern or cinema lectures* and other forms of propaganda work in maternity and child welfare

(8) *Statistics and records* of the home and 'dais' attached to it must be very carefully kept to convince the critics of the utility of such works I find Dr Young's system very satisfactory in this respect

The eight items mentioned above more or less complete the work of a unit of a maternity and infant welfare centre in my opinion

I shall now say a few words about the funds required In Gwalior it costs us roughly about Rs 8 per child born My budget for Gwalior town with a population of nearly one hundred thousand and an annual average number of three thousand births is Rs 25,000 a year As regards response from the public, I think it will soon come if they are convinced of the value and utility of the work This cannot be done, to my mind, by holding a baby week only once a year Continuous sectional propaganda all the year round in various wards of a town is essential This can be done by the staff attached to welfare centres, as also by educated persons who are keen on doing some organized social work I consider this an important point. A part of the propaganda work should be devoted to creating interest in the public by showing them how, without taxing much of their time or money, they can be useful, even though in a small way, to help and further this cause Even the uneducated can help in various ways, and it gives opportunities for all kinds of people to do some kind of social service for their fellow citizens

This is just an outline of a scheme for a big town like Gwalior. Within a few years we hope to extend it to smaller towns and villages and rural areas.

Dr. J. N. Leitch (Assam): Perhaps because of the innate kindliness of the gentler sex who rightly occupy the doyen of this discussion, I do not think that the responsibility of the husband and father has been sufficiently emphasized. We speak of the helplessness of the children, the ignorance and superstition of the mothers, the lack of skill and cleanliness of the midwives, the paucity of well-trained doctors, but, be these as they may, I would lay the blame at the doors of the fathers. It is the fathers who are four times more literate than the mothers of India, they mingle with the outside world but they hold fast to their prejudices, they deny to their wives the freedom they claim for themselves, and condemn their children to a life which is no better than their own.

I suggest that concurrently with child welfare and maternity centres, paternity clinics should be held to explain the possibility and necessity of purity and temperance, the responsibilities of creative power and the duties of the father to the mother and child.

Dr. M. I. Balfour (Bombay): I should like to refer to one part of Dr. Headwards' paper on the importance of antenatal work in the direction of research as well as of treatment. We know some babies are born healthy, some feeble, why? Not necessarily poverty, because many poor people have healthy children. We need careful medical research in this direction.

I should like to ask Dr. Commissariat if she can give us any evidence that 50 per cent of early infant deaths are due to tetanus. Infantile tetanus certainly exists, but is apt to be confused with convulsions due to intra-cranial injuries received during birth.

I agree with Dr. Young that the work of many infant welfare centres is hindered by lack of knowledge on the part of the organizers, although they are energetic and keen. I think her proposal that a full-time worker should be attached to the staff of the Directors of Public Health in each province is an excellent one. Such a worker would have time to study conditions in the province and initiate measures suitable for India gradually securing their adoption.

Mrs. Alice M. Pennell (B. India): I wish to add my support to Dr. Balfour's suggestion for a health officer, preferably a woman doctor (whose medical and scientific training fit her for the work), to be attached to the Director of Public Health in each province in India.

To lessen the ignorance of which we have heard complaints from many speakers, I suggest that some one like Dr. Ruth Young should write a small handbook for health workers on the lines of the Red Cross First Aid and Home Nursing booklets. The Red Cross in peace time does so much for public health that it might be induced to finance such literary ventures.

Dr. Dhunjibhoy Mehta (Baroda, B. India): I am afraid I am not in a position to say much on the points raised by the lady in the chair, yet I may be allowed to say a few words on some others. First then I would allude to propaganda work. While talking to a high officer only yesterday he gave me to understand that there was too much of it just now and that people were getting fed up. Another gentleman again was pessimistic about training indigenous 'dais.' I must admit that there is some truth in these assertions, for just now there are various organizations like the Lady Chelmsford League, the baby week movement, the co-operative societies, the rural community councils,

the reforms society, etc, doing health propaganda work so that there is, perhaps, a certain amount of overlapping Moreover, some of us who have been doing this work perhaps occasionally feel that it is like knocking our heads against a stone wall and that the results are not commensurate with the efforts made, yet on the whole I think there is no reason to despair Much is being done but much more still requires to be done We Indians have been sleeping the sleep of the just for ages and it is high time we woke up and tried to arouse if not create, a sanitary conscience amongst the people When I advocate the necessity of doing continuous propaganda I must at the same time emphasize the necessity for uniform instruction I have already mentioned the various organizations undertaking the work but I have found occasional differences in the instruction given to the public e g, the Lady Chelmsford League lays stress on the non necessity of feeding the infant at night from the day of its birth, whereas the reform society teaches that the child should be fed twice at night during the first three months and once during the next three You can imagine the effect of such different teachings on the lay mind Hence I would urge the necessity of making all instruction uniform

Another question is that of finance It has been mentioned that the people should be asked to contribute towards child welfare work etc In that connection, too I must say that nowadays there are so many different movements going on doing nearly the same kind of work that people do not know which to subscribe to and which not Many do not know the difference between the League s and Reforms' work or the St John s and Reforms' work with the result that none of them gets the support that is necessary Besides, in these days of unusual trade depression it is hard on the people to ask them to subscribe to so many organizations We all know personally how many calls there are on our purses and how we are unable to meet them, notwithstanding our best wishes and sympathies I would therefore suggest that the powers that be should lay their heads together and try to amalgamate the various movements into an universal one so that there may not only be uniform instruction but that people may understand its significance and so subscribe to it readily I know there are many difficulties in the way for the names of high personages have been linked with many of the schemes, but I dare say, if a serious attempt is made a method of amalgamation can be found Perhaps I may be allowed to suggest one way that all these movements should be merged into the Red Cross My reasons for this suggestion are —

(1) The Red Cross is an all absorbing humanitarian movement for the betterment of mankind as is proved by its motto which runs thus —'Improvement of health, prevention of disease and mitigation of suffering in peace and in war' The improvement of human health necessarily begins with the mother and child and thence goes on to mankind in general, hence, on the principle of the part being merged in the whole, the infant welfare, maternity and other cognate movements should be merged into the Red Cross one

(2) The Red Cross spends much money in child welfare work each year, e g, in the Bengal provincial branch report for 1926, it is mentioned that out of a total expenditure of about Rs 71,000 over Rs 13 000 were spent for child welfare centres, Rs 2 000 for a training school for welfare workers and Rs 9,000 for sisters for up keep and rent for baby clinics, viz, nearly one third of the whole sum allotted Taking the reforms society

as a whole we find that out of a total income of about Rs. 520,000 in 1926, the different branches spent as much as Rs. 140,000 yearly for child welfare and nursing.

(3) Different Provincial Governments help the Red Cross in its child welfare and propaganda work by special grants, e.g., Assam gave Rs. 10,000, Bihar & Orissa a like sum, and the Central Provinces paid Rs. 20,000 last year and so on.

Finally, I would add that the Central Government should liberally finance all health activities through a central organization, preferably the Red Cross, so that uniform and continuous propaganda may be possible and the public may appreciate its benefits and subscribe to it liberally also.

Dr. A. J. Rosedale (Singapore) : The most noticeable point to a stranger to the second city of the British Empire is that, during a week's stay, fewer women are seen than would be met in a quarter of an hour in an English village. That is the problem and it can be tackled only by women. Women, medically trained, are doubtless superior for the work, but voluntary workers can be trained by specialists in the various subjects such as sanitation, nutrition, etc. When these volunteers will take the trouble to train so as to make the utmost use of their work, they can become a useful factor.

Dr. H. M. Lazarus (Madras) : I appreciate the work done by present organizations, though there is, I admit, much more room for improvement. The work has been educative, inasmuch as it has taught the poor to appreciate good midwifery ; prophylactic, as it has lessened the number of abnormal cases and meddlesome midwifery ; curative, as it has lowered infant mortality.

The training school to be shortly opened in Madras shall train women doctors in maternity and child welfare and public health and grant them a diploma. Women who have had only a training in midwifery will not be made good health visitors.

A whole-time officer for each province, Deputy Directress of Maternity and Child Welfare, should be appointed. Voluntary workers should still be encouraged; students from colleges, arts, engineering, law and agriculture, should be encouraged to do more social work and also be given lectures and demonstrations at the centres. It is difficult to educate the fathers, and still more the city fathers, so begin with the students.

Dr. A. C. Roy Chaudri (Bengal) : A great deal has been said about the illiteracy and social customs of our country which stand in the way of child welfare and maternity work. If we are to wait till illiteracy and social customs improve, we will have to wait long indeed. The proper course is to start the child welfare centres and maternity houses in important centres and then we will find that the prejudice will all disappear. Illiteracy and social customs did not stand in the way of people taking advantage of the hospitals, kala-azar centres, and other utilitarian institutions. The ignorant villagers do care for their wives and children just as much as we do. It is thus a question of organizing a special department under the public health department of each province and of training up a staff as health visitors. Centres may then be started in towns and important villages and we will find that people will take advantage of them. Funds must be found to organize the work on a comprehensive scale so that the benefit of such institutions may be evident to the people in a comparatively short time. The present organization of public health work in Bengal with a sanitary inspector in each thana will considerably help the work of child welfare and maternity organizations.

Dr L A Rahman (Punjab) In the Punjab the work was commenced in 1923 with two fully qualified ladies from England in charge In addition to the infant welfare work the activities were further extended by establishing a health school at Lahore to train lady health visitors The school was financed by grants in aid from the Government and the Lady Chelmsford League As there was no stability under these arrangements, it was proposed by Col Forster, Director of Public Health that the school should be provincialized and I am glad to say, the Punjab Government accepted the proposal as from 1st April, 1927 About eight lady health visitors are trained in this school every year and since last year are also trained in vaccination We have now extended the infant welfare work to rural areas I personally believe that the right type of women are not coming forward to take up the work of lady health visitors but I am sure when people begin to realize the benefits of this special work, we shall get a better class of Indian women to take up this profession

Dr Ruth Young (B India) replied It is noticeable that in the discussion there has been a distinct tendency to wish that child welfare work should be attached to women's hospitals, especially maternity hospitals and maternity homes This is an excellent move and a logical proceeding but it must be remembered that the medical women themselves must have training for the work for it to go on on right lines There is also a general agreement that, for the proper development of child welfare work a medical woman, working under the Director of Public Health, should be appointed in each province to specialize in child welfare work Sometimes it happens that in such conferences as the present, there is a great deal of enthusiasm and when the people leave the conference and go to their own places the enthusiasm seems to evaporate and nothing concrete is done I suggest that this is a thing for which we might all work and each press for such an appointment in his or her own province Dr Mehta has suggested that the work for child welfare should be centralized under one authority to prevent overlapping and feels that the Red Cross Society is the body to undertake the work I venture to think that however desirable it is to avoid overlapping that can hardly be a thing to be aimed at as long as there is no medical woman represented on the central committee of the Red Cross Society

Dr A Headwards (Bengal) replied With regard to Rai Bahadur Chuni Lal Bose's remarks I would like to say that I think one of the reasons why the patients are attracted to the two new maternity homes in Calcutta to the disadvantage of the Eden and Carmichael hospitals is because the latter are teaching institutions where medical students attend or witness many of the cases This is naturally objected to by a large number of Indian women He also states that there are four Health Officers in Calcutta but I venture to say they are not trained welfare workers In reply to Dr Roy Chaudri, I quite agree with him on the need of welfare work in the districts There are however, two obstacles to its attainment, (1) finance, this might be met with locally, and (2) the supply of trained welfare workers He advocates a training in the 'sanitary school I would venture to suggest that these students might well be trained in the Bengal training school for welfare workers

THE PRESENT STATUS OF MATERNITY AND CHILD WELFARE WORK IN THE PHILIPPINE ISLANDS.

BY

JOSÉ FABELLA, M.D.
Public Welfare Commissioner, Manila.

THE Office of the Public Welfare Commissioner was created by the Philippine Legislature in 1921 and was organized and began to function on May 1 of that year. This office has three main activities; namely, (1) to promote, co-ordinate, and regulate all work related to maternity and child welfare in the Islands; (2) to administer and operate orphanages, training schools or reformatory schools for minor offenders, and other child-caring institutions; and (3) to promote and co-ordinate the work of all charitable organizations receiving government aid as well as other organizations intended for charity or for the improvement of living conditions in the Islands.

The Office of the Public Welfare Commissioner encourages the establishment of organizations generally known in the Islands as puericulture centres, the purpose of which is to protect early infancy and to guide women toward a sound and intelligent motherhood. To act as a central directing and co-ordinating body, the Office, through its division of maternity and child hygiene, directs the technical work of puericulture centres and acts as an advisory body in matters pertaining to the administration of these centres. During the year 1926 there were 231 puericulture centres in operation with a total attendance of 623,813 mothers and children. The total number of house visits made by the nurses was 600,197.

In order to carry out its work properly and adequately, this central organization has to do the following:—

(1) To give a short course of training to physicians and nurses who are to take charge of puericulture centres;

(2) To train midwives so that after their graduation they can return to their respective communities, practise midwifery, and thus gradually supplant the ignorant unlicensed midwives who are extensively found in all towns and other places in the Islands;

(3) To conduct educational campaigns by distributing pamphlets and other literature giving information and instruction on various phases of maternity and child welfare, by giving public lectures and demonstrations, moving picture shows

and baby contests and by giving out posters and by other means with which to enlist the interest and support of the public in the campaign against infant mortality ,

(4) To furnish the services of medical officers and nurse supervisors who visit, help, and improve the work carried out in maternity houses and puericulture centres in the various towns in the Islands and

(5) To render financial assistance in the form of government monetary aids to these centres The amount given does not exceed the total amount collected for each centre, including what is appropriated by the municipality or province in which the centre is established This central organization also works in close co operation with other government and private agencies that are either directly or indirectly working in the interest of maternity and child welfare such as the Philippine Health Service, the Bureau of Education and the Philippine s Chapter of the American Red Cross At present the Office of the Public Welfare Commissioner, through its Division of Maternity and Child Hygiene employs 13 physicians 57 nurses, and 13 midwives It also operates various training centres in Manila, Cebu and Bacolod for the training of midwives and other workers It is the practice of the Office to have these centres visited at least once a year to ascertain their needs and to help them in the solution of whatever problems and difficulties they may encounter which in most cases are peculiar to the town where the puericulture centre is established

As a means of bringing about interchange of ideas and improvement in the methods procedure, and the general functioning of puericulture centres, a convention or institute is usually held once a year which workers in puericulture centres are required to attend

The organization of a puericulture centre must start first from local initiative Prominent people, usually women of the locality, associate themselves together to form the organization Generally, the people who are interested in this organization have already secured the necessary information and instruction from the Office of the Public Welfare Commissioner to enable them to receive the benefits granted by law to such organizations before they are established The administration of a puericulture centre is placed in the hands of a board of directors elected yearly by the members of the organization However, the technical work, as already stated above, is placed under the direction and supervision of the Public Welfare Commissioner who passes on the appointment of the technical personnel recommended by the board of directors

In order that you may have an idea of how a puericulture centre operates, the following enumeration of its activities is given It has consultation days when mothers and babies are registered, weighed, measured, examined, and given prescriptions whenever they are sick Lectures and demonstrations relating to maternity and child hygiene are given, such as showing how to bathe a baby, how to prepare artificial feeding, how to prepare clothing, layettes, etc Lectures to unlicensed midwives are also given On certain days of the week, the centre conducts special pre natal clinics for mothers The nurse makes house to house

visits to see whether the instructions given to the clients of the centre are being followed.

She likewise visits remote rural communities known as 'barrios' and gives lectures and demonstrations on the proper care of the mother and her child. She also attends to delivery calls, accidents, and emergency calls in time of disasters or epidemics.

During 1926, there were 330 puericulture centres organized all over the Islands, 99 of which were not in actual operation due either to lack of sufficient funds or to their inability to secure the services of the required technical personnel.

For the operation of puericulture centres, the Central or Insular government contributed in 1926 the amount of one hundred and fifty thousand pesos (P. 150,000.00), not including the salaries paid for the maintenance of the Division of Maternity and Child Hygiene in the Office of the Public Welfare Commissioner and the salaries and travelling expenses actually incurred by physicians, nurses, and midwives who supervised these centres. The total expenditures of these puericulture centres in 1926 amounted to P. 335,724.80. As of December 31, 1926, the personnel of these organizations was distributed as follows: 85 private physicians, 64 medical health officers, two constabulary physicians, one dentist, 135 nurses, and 71 midwives.

For administrative and other reasons, puericulture centres are divided into four classes, viz., Class A, Class B, Class C, and Class D, according to personnel, equipment and activities.

Class A.—A centre under this class must have at least a full-time nurse and a physician to conduct regularly the consultation service. It must be equipped at least with a scale and height-measuring device, a visiting nurse's handbag with standard supplies, and a supply of stock medicines for the ordinary need of the centre. Consultation must be conducted by the physician assisted by the nurse. Home visits, including the follow-up of cases attended in the centre, must be performed by the nurse. Lectures on child hygiene are given by the physician or the nurse.

Class B.—The requirements for a Class B centre are the same as those for a Class A centre, except that the services of a physician may not be regular or may be lacking entirely.

Class C.—A centre that has a part-time nurse who devotes a great deal of her time to dispensary work or consultation with very little visiting and conference work is grouped under Class C, although there may be regular consultations conducted by a physician. Puericulture centre organizations which employ graduate midwives, doing at least outside delivery and visiting work, also belong to this class.

Class D.—A centre duly organized in accordance with the requirements of the Department of the Interior, Order No. 10, Series of 1921, but not in operation, belongs to this class.

The classification of a centre is changed when it has undergone any modification or alteration in its personnel or operation for a period of three months.

The puericulture centre organizations are encouraged whenever possible to establish maternity houses. At present there are three large maternity houses

located in three different regions of the Islands, namely, Manila, Cebu, and Bacolod The purpose of these maternity houses is not only to give facilities to the indigent parturients, but also to furnish practical experience to the students of the schools of midwifery operated in connection with these maternity houses From 1923 to June 1927, there were graduated 205 midwives from these schools of midwifery There are 15 other maternity houses established in different parts of the Islands operated also by the local puericulture centres with an aggregate capacity of 150 beds

Infantile beriberi is one of the greatest causes of infant death during the first months of life For the present, the alcoholic extract of tiki tiki is the only means available to combat this disease and for this reason a wide and free distribution of tiki tiki extract is being made all over the Islands through the puericulture centres, health stations, hospitals and dispensaries This extract is prepared by the government Bureau of Science and is placed in 60 c c containers hermetically closed It is used not only as a medicine to cure infantile beriberi, but is also used as a prophylactic During the year 1926, there were distributed 49,790 bottles of this extract

There are other agencies in the city of Manila which are working in the interests of maternity and child hygiene the most important of which are the 'Liga para la Proteccion de la Primera Infancia' or the 'Gota de Leche,' the main function of which is to distribute fresh cow's milk properly prepared in accordance with the formula suited to the individual baby brought to its consultation clinics There are also various hospitals and dispensaries which conduct children's clinics such as the Philippine General Hospital, the Mary J Johnston Hospital, the Mary Chiles Hospital the St Luke s Hospital, the puericulture centres of the Philippine's Chapter of the American Red Cross, and of the Philippine Health Service, the Philippine Islands Anti tuberculosis Society, etc

The Philippine's Chapter of the American Red Cross furnishes the public schools with the services of school nurses, besides the special activity of the Junior Red Cross which furnishes practically all school children in the public schools with dental care and attention

The physicians of the Philippine Health Service likewise conduct the physical examination of the school children

Conclusion

It is gratifying to note that for the last seven years during which the Office of the Public Welfare Commissioner has been in operation, a great deal of interest has been displayed by the public in maternity and child hygiene As a general rule, once a centre is established, it remains in continuous operation throughout the year

Infant mortality in the towns where puericulture centres are established has decreased (In 1926 infant mortality rate in these towns was [illegible], while that for all over the Islands for the same year was 156·71) We feel that [illegible]

and accomplishments have been made in maternity and child welfare work as evidenced by the constant request for the establishment of puericulture centres in communities where no such organizations exist; by the existence of a large body of nurses who have received some special training for maternity and child hygiene work through whom the extension of the educational work of the centres is made by means of conferences and house-to-house visits; and by the gradual elimination in small communities of the ignorant unlicensed midwives by trained ones.

In conclusion I wish to state that, although in presenting this short account of our activities concerning maternity and child welfare, I have limited myself to a discussion of those organizations that are working directly for the protection of mothers and children, it should be noted that the general improvement in public sanitation, the extension of public education and the general progress along economic and social lines have likewise contributed indirectly to the steady reduction of the infant mortality rate in the Philippine Islands.

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